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The City Lighting.

A STATEMENT OF FACTS.

Mr. Edward A. Leslie, of the Manhattan and Harlem Electric Light Companies, of this city, has prepared the following statement showing the cost of placing wires for city lamps underground and operating therefrom. Mr. Leslie has taken for an example the Harlem Lighting Company's circuit on Third avenue, from 80th street to 130th street. If nothing else can convince the city authorities that their demands upon the electric light companies are unjust, this frank statement ought to have the desired effect:

HARLEM LIGHTING COMPANY'S CIRCUIT ON THIRD AVENUE, FROM 80TH STREET TO 130TH STREET.

Number of lamps	55	
Distance in miles	2¼	
4½ miles of cable at $1,108.80 per mile		$4,989 60
Laying same at three cents per foot		712 80
Jointing same, 100 joints at $2.50 each		250 00
Incidentals, trucking, etc		250 00
Total		$6,202 40
Total per lamp		$112 77
Cost of subsidiary connection to lamp post	$83 63	
Cost of changing post to receive cables	12 00	95 63
Total per lamp		$208 40
2¼ miles subway duct at $1,000 per mile per annum per duct		$2,250 00
Assume that cables for city lamps occupy only one-half the duct capacity, amount of rental chargeable is		1,125 00
Subway rental per lamp per night		5½ cents.

Guaranteed life of cables is three years. Assume that they will last ten years, which is much beyond the most sanguine expectations, and charge for depreciation and renewal 10 per cent. on $208.40, $20.84 per lamp per annum, or per lamp per night, 5.7 cents, making a total increase of operating underground as against overhead, of 11.2 cents per lamp per night.

The following summary is based on the cash accounts of several large electric light companies, outside of expenditures for poles and overhead wires.

SUMMARY.

Cost of cables, connections, laying, etc.	$208 40
Relative cost of station buildings, dynamos, lamps and apparatus, per lamp	400 00
	$608 40
Interest, taxes and general expense, on an expenditure as above of $608.40, say 10 per cent. per annum	60 84
Annual cost of producing and delivering current at lamps, at 20 cents per lamp per night	73 00
Annual subway rental, at 5½ cents per lamp per night	20 07
Annual depreciation of cables, 10 per cent. of $112 77	11 27
	$165 18
Annual revenue from city at 39 cents per lamp per night	$142 45
Annual loss to Electric Light Company per lamp	22 73

The Clark Automatic Safety Device.

If a live electric light wire breaks and the dynamo continues to generate current, it is well known that an E. M. F. is maintained at the ends of the broken wire, which, with some forms of apparatus, may be even greater than the normal working E. M. F. of the machine. Now, if the broken ends of the wire come in contact with another conductor, thus closing the circuit, an enormous rush of current takes place, which in some cases has been sufficient to wreck the dynamo. If, in falling, the broken lines cross with telephone or telegraph wires, the instruments attached to these wires are usually destroyed and there is a serious possibility of fire. On the other hand, if the broken wires dangle in the streets, there is a possibility of severe and even dangerous shocks to persons or animals coming in contact with them.

The object of the Clark Electric Company's safety devices, patents on all the various forms of which were recently issued, is to prevent such accidents by putting the dynamo out of action the instant the wire parts, thus avoiding all danger of damage to the machine, as well as of accidents from fire or shock. These devices are constructed in various forms, according as they are to be used for series or shunt wound, arc light dynamos or for alternating current machines.

The illustration on this page represents the device for series wound arc machines, and it will be noted that the mechanical construction is of the simplest possible form. The small electro-magnet shown is located in the main circuit, and as long as the current flows, its armature lever is held firmly up, locking the switch in position. Should the line break or be cut by firemen or others, the current ceases instantly, and the armature of the electro-magnet falls, releasing the switch, which flies back under the influence of its spring. The result of this movement of the switch is to close a short circuit across the field coils of the dynamo, thus depriving them of all current, and, of course, rendering the dynamo powerless.

AUTOMATIC SAFETY DEVICE FOR HIGH TENSION CURRENTS

The hard rubber knob shown at the top of the magnet, is attached to a rod reaching through the magnet core, and is used as a convenient means of throwing the dynamo out of action at any time, it being only necessary to force the armature away from the magnet, by pressing down the knob, to put the machine quickly out of action without any strains or shocks.

Another valuable feature of this device is that it works automatically every time the dynamo is stopped or put out of action, and it must be re-set by hand, as the last thing to be done when starting the machine on its load. This in a measure insures its action, when it is called upon, for should it get damaged or out of order the attention of the person in charge is called to it, as he must operate it every night in starting up.

The safety devices for shunt wound dynamos and for alternators, vary somewhat from the foregoing description in their electrical details, but the above will show the general plan on which all are constructed; the object in all varieties of the device being to put the machine out of operation instantly upon the breaking of the line, and to accomplish this with absolute certainty and without endangering the machine in any way.

American Names for Electrical Units.

At a meeting of the American Meteorological Society, held at the Columbian University, in Washington, on the 21st inst., the following resolution was unanimously adopted:

Whereas, It has been generally admitted among scientific men that the nomenclature of electrical units of measure should perpetuate the names of early electricians who have contributed most to the advance of electrical science; and

Whereas, In the names thus far adopted, the eminent services of Americans have not been recognized; therefore,

Resolved, That, in the opinion of the American Meteorological Society, a just distribution of the honor thus bestowed, demands a recognition of the splendid contributions of one or both of America's great electricians, Benjamin Franklin and Joseph Henry, and that the society will gladly co-operate with the numerous organizations of electricians in the country, in an earnest effort to secure such action.

Professor Mendenhall, who presented the resolution, said that the names thus far given to electrical units are those of some of the most eminent scientists in Europe, but none of them outrank those of the Americans named. The selection of these names would be an honor to the cause of science. There are a few units still unnamed, and nothing could be more appropriate than to designate them by the names of Franklin and Henry.

Prof. Francis B. Crocker, of Columbia College, who attended the meeting as a delegate from the American Institute of Electrical Engineers, strongly advocated the movement and pledged the Institute to a hearty co-operation in the undertaking. He believed that it would take all America to bring about the object and urged concerted action on the part of all societies and persons interested. The Paris Electrical Conference adjourned to meet in this country in 1892, and American electricians should be prepared to go before the next meeting in a solid body and unanimously request recognition for their countrymen. Professor Crocker expressed the opinion that there would be a peculiar fitness in giving the name of Henry to the unit of self-induction, for the reason that he was the first to investigate this branch of the science and that his work was more complete than that of any other investigator in that line, before or since.

The executive committee of the Missouri and Kansas Telephone Company held a meeting in Kansas City, last week. Among other matters that of adding facilities for 200 more telephones was considered, and it was determined to take no action at present. New subscribers will have to wait for telephones unless old subscribers relinquish their instruments.

REMOVAL NOTICES.

NAMES OF FIRMS WHO WILL SEEK NEW QUARTERS.

As announced recently, we present herewith a list of business houses which have been compelled to change their addresses on account of the need for increased facilities or other reasons. Unless otherwise stated, the removals occur May 1st:

Ball Electric Light Company, from 18 Cortlandt street to 404 West 27th street.

W. R. Ostrander & Company, from 21-25 Ann street to 195-197 Fulton street.

American Electrical Works, New York office, from 18 Cortlandt street to 10 Cortlandt street, first floor.

The "C. & C." Electric Motor Company's Boston office, from 148 High street to 63 Oliver street.

The F. M. Ricketts Company, from 14 Cortlandt street to 24 Cortlandt street and 19 Dey street.

Standard Underground Cable Company, from 18 Cortlandt street to *Times* Building, corner of Park Row and Nassau street.

The Crocker-Wheeler Electric Motor Company, from 322-24 Seventh avenue to 430-32 West Fourteenth street, corner of Washington street.

The Seely & Taylor Manufacturing Company and the Complete Electric Construction Company, from 14 Cortlandt street to 24 Cortlandt street and 19 Dey street.

The Mather Electric Company's Chicago office, from 11 Metropolitan Block to 10 South Canal street, and the Cincinnati office of the same company, from 56 Longworth street to 28 West Court street.

General Electrical Notes.

The Baxter Motor Company, Baltimore, will start up in good shape this week. General Manager D. E. Evans has got matters well in hand, and the well arranged factory will soon be a very busy scene. All the motors which were scattered around at the former agencies of the Baxter company have been returned to the Baltimore office, and will be overhauled.

R. T. McDonald, of the Fort Wayne Electric Company, is a Baltimore visitor looking the landscape o'er.

The Detroit Brush Electric Light Company actuated by the fact that it no longer has a contract with the city and is not using its towers, asked the assessors to reduce the assessment. The request was denied.

The Marysville, Cal., Electric Light and Power Company has contracted with a San Francisco firm for a Corliss engine and boiler to cost $6,500. This plant will be used for incandescent lighting.

The Buffalo City Council has finally decided to have an electric railway on Niagara street, provided the wires are buried.

The contest for electric street railway privileges at Atlanta, Ga., is quite spirited. A number of applicants are in the field.

An electric street railroad will be built this season at Duluth to take the place of the mule nuisance now in operation there.

Electric lights will gleam from two 350 feet high towers at Cramer Hill, Camden, New Jersey.

Electro-Technical Exhibition at Frankfort-on-the-Main.

The Frankfort Electro-Technical Exhibition will be opened on the 1st of May, 1891, and continue to the end of October. The exhibition will be under the direction of the Electro-Technical Society, of that city; and a large committee, chosen from among its members, has taken hold of the work of preliminary organization, the provisions of ways and means, etc., with great unanimity and energy.

It is proposed that the exhibition shall be organized and conducted on the same general plan as the electrical exhibitions held at Munich in 1882, at Vienna in 1883, and at Paris during the following year, especial prominence being given to the inventions and improvements which have been made in electro-technical science since that time. The exhibits, according to the United States Consular Reports, will be grouped as follows:

1. Motors for electro-technical purposes, such as steam, water, air, gas engines and steam generators, etc., and accessory apparatus.
2. Generators of electricity.
3. All kinds of apparatus for conducting and distributing the electric current, accessory apparatus, etc.
4. Accumulators, transformers, etc.
5. Devices for transmission of electric energy and its employment for industrial purposes, etc.
6. Electric lights, and a special section for fittings of all kinds.
7. Telegraphy, telephony, safeguards against lightning, fire, theft and other dangers, telegraphic fittings for houses, hotels, etc.
8. Electrical appliances and apparatus for railways, tramways, ships and nautical science.
9. Electrolysis, electro-metallurgy.
10. Electric apparatus for scientific, measuring, optical, acoustical and school purposes, etc.
11. Electro-therapeutics, electro-surgery.
12. Electrical literature, etc.

For the purposes of the exhibition, it is proposed to erect adequate buildings upon the land vacated by the railway companies since the withdrawal and concentration of their lines in the new union depot. This gives an area of 538,000 square feet, centrally located between the railway station and the business part of the city. It is, moreover, contiguous to the union freight depot, from which a track will be laid for the easy transportation of exhibits which arrive and depart by rail.

Concessions for the use of this land have already been secured, and work upon the buildings will be commenced at once. It is important that intending exhibitors should at the earliest possible moment give notice of participation. Such notice should state clearly how much space is desired, whether on the floor or wall, or both, or in a separate pavilion; also how much motive power (horse-power)—steam, gas, air or electrical energy—will be required for the intended exhibit.

It is confidently expected that the privilege of entry free of duty will be secured for all machinery and appliances coming from foreign countries solely for the purposes of exhibition, and the railway companies promise prompt transmission, at favorable rates, of all freight destined for Frankfort for the same purpose. It is expected that this exhibition will have an especial importance in all that relates to electric lighting. In several cities, among which Frankfort is included, it has been decided to erect plants for the transmission of energy and lighting the streets by electricity. But they are all, as yet, more or less undecided which system to adopt. It is probable that the effect of the forthcoming exposition will be to decide these questions. Whatever system makes the best and most plausible show at Frankfort will be likely to obtain some important commissions in southern Germany, where the experiment of overhead wires has not been and is not likely to be tried, and where public sentiment is unprejudiced by any previous failure or mishap.

Another important department will be that of electrical motors for street railways, in which many of the German municipalities are now deeply and practically interested. It is earnestly hoped by the management that American inventors may be induced by these circumstances to present as full and representative a display as possible of the inventions and improvements in electrical science which have been made in our country during the past five years.

All communications relating to space, etc., should be addressed to Leopold Sonnemann, Esq., editor of the *Frankfurter Zeitung*.

Herr von Muller, of Munich, formerly manager of the "Allgemeine Elektrizitats-Gesellschaft," of Berlin, has been chosen to superintend the work connected with the exhibition.

Herr von Muller, who took a leading part in the Munich Electrical Exhibition of 1882, contributing not a little to its success, will shortly make a tour of Europe in order to personally promote the interest of the undertaking.

A Solid Steel Car Wheel.

The illustrations on this page show a type of solid steel car wheel, manufactured by the American Steel Car Wheel Company, of Boston. The weight is about 260 pounds, and the wheels are made to fit any dust guard or box. The metal is sound, tough and homogeneous throughout, and will not chip off like the chill of an iron wheel, but wears uniformly. The tread may be turned down like the tread of a steel-tired wheel, and will not glaze over and become smooth like iron. It is claimed that there is greater adhesion in the use of a steel wheel upon a steel rail. The makers claim for this wheel greatly increased strength, a larger mileage, and better traction.

SOLID STEEL CAR WHEELS.

The West End Street Railway Company, of Boston, have equipped many of their cars with this wheel, after months of experimental service. They are also in use on the Robinson Radial Car Truck and the Tripp Manufacturing Company Truck, as well as on other street railways.

Anything But Lightning.

Lester Skeesucks, night watchman for the Norwich & Worcester Railroad in Norwich, had a wonderful Newfoundland dog which faithfully had followed him on his lonely beat without missing a night for 17 years, until last Wednesday, when the old dog died. "Jack" was afraid of nothing on earth save lightning, and he was in mortal terror of that. Five years ago, at the height of a blasting thunder storm, he fled as if mad from town, boarded a northward-bound train, crept under a car seat, and did not emerge until the sky cleared, when he hopped off the cars at Jewett City. Lester had to go up and get Jack, and reason with and coax him, in order to induce him to return, for the poor dog had got the notion into his noddle that thunder and lightning were indigenous to Norwich alone, and that if he abided in Jewett City he could avoid the slam whanging aerial terrors.—*N. Y. Sun.*

—— A force of electricians is at work in the Brooklyn Library taking down many of the old gas burners which have served as a source of illumination for so many years, and putting Edison incandescent electric lamps in their place.

Welding Tires and Axles by Electricity.

The first plant put into use for welding tires for wheels is now in daily use at the works of the Parry Manufacturing Company, of Indianapolis, says the *Implement Herald*. The dynamo requires about 80 horse-power, and is run from a counter shaft that is belted direct from the main shaft, thus operated by their enormous 1,000-horse-power engine. From this dynamo are run insulated wires, about $\frac{5}{8}$ inch in diameter, to the different welding machines. These are about twice the size of an ordinary blacksmith's anvil, and are arranged so that the tire is instantly gripped by eccentric levers about one inch from each end of the tire. These ends are brought together by lever power, butt to butt, when the electric current is turned on by a foot lever. The current heats a tire $\frac{7}{8} \times \frac{1}{4}$ inches in about a quarter of a minute to a welding heat, when with the same lever the butts are brought together, the operator upsets the joint; releasing the foot lever turns off the current; when the eccentric clamps are thrown back, the tires are removed and pounded on the anvil, the same as an ordinary fire weld,

Mr. Parry claims and proves conclusively that where the weld is made the tire is strongest, the electricity having a refining influence on the steel. The weld is certainly clean and perfect, as there can be no dirt, slag or sulphur in the weld. Mr. Parry said: "These three machines as you see them will turn out a little over 2,000 welded tires per day of 10 hours. It is entirely safe, as the current will not hurt anyone coming in contact with it; you cannot even feel it."

Their axle welding machines are operated the same as the tire welders, but are a little heavier. In answer to the question as to whether he considered the welding machine perfect, Mr. Parry said: "I do not say that it is impossible to improve the machines, but it is so much superior to anything yet produced that no manufacturer can afford to wait to see if it can be improved upon. In some minor details, improvements may be made, but in the main the process is perfect. The cost compared with coal is so much less that it is hard to make a comparison. We do not expect to use one pound of coal or coke in 1890. We use electricity for all our welding and natural gas for forging."

The Edinburgh International Exhibition, 1890.

On the 1st of May next there will be opened in the historic city of Edinburgh an international exhibition of electrical engineering, general inventions, and industries; and the occasion, it is expected, will be honored by the presence of royalty,

Not only will there be a very large representation of electrical machines, etc., but in several instances electricity will be directly applied and demonstration given of its utility. The buildings and grounds will be lighted by a most complete installation, there will be an electric railroad from the Caledonian Station in the northwest corner of the grounds, sweeping round the western boundary to a point adjoining the Surburban Railway, and four launches driven by electricity will ply on the canal between Edinburgh and the exhibition. There is also in the northern part of the grounds a short electrical telpher line, showing the principle introduced some years ago by the late Professor Fleeming Jenkin. This, with another system of traction, which, by the way, is about 760 yards long, is being laid down by the United Electrical Engineering Corporation, Limited, London. The permanent way will be the usual gauge, 4 feet 8½ inches, and the rolling stock will be electric tramcars.

Mica.

TO THE EDITOR OF ELECTRICAL REVIEW:

We notice that the articles presented to the readers of the REVIEW favoring the retaining of mica on the free list are very severe on the question of the quality of mica produced in the United States.

The claim is also made that there is not a sufficient quantity mined to meet the requirements of the electrical companies.

The product from our mine has never been found fault with, and has met every requirement. We are now supplying the largest electrical companies in the world, and they seem to be perfectly satisfied.

So far as we are aware, we are now the only producers of mica in the United States; but if the importation of foreign mica continues without a duty being placed upon it, we shall be compelled to cease operations.

As a matter of fact, therefore, the electric companies of this country would, in that event, occupy a very much less advantageous position than at present, since they would be dependent wholly upon the foreign market for their supplies of this product.

The arguments presented by some of the electrical companies to the Ways and Means Committee at Washington, recently, have been misleading.

If American miners of mica were properly protected by having a specific duty on the foreign article, it would stimulate the production here, while our company, for example, would be prepared to meet the demand and supply as good a quality as can be purchased.

We take this opportunity, also, to characterize as absurd and untrue the charge that American mica is inferior to the foreign article, or that this country is unable, under fair and equitable conditions, to supply the demand.

Very truly,

The Palermo Mica Company,
F. M. LARCHAR, Treasurer.

New York, April 15, 1890.

Drexel Industrial Institute.

Contracts were signed last week for the construction of the Drexel Industrial Institute buildings, at Philadelphia. The main building will be about 200 feet square, and the schools of the institute will accommodate from 2,000 to 2,500 pupils.

Special attention has been given to the lighting, heating and ventilation of the building. The boilers will face the eastern front, where coal will be taken in; engines and dynamos for electric lighting will occupy the central part of the basement under the central hall, and will be partly lighted from the glass floor under the skylight. As the engines and dynamos will be used for instruction, they are to be enclosed only by a railing, being thus left open to the view of all who enter the basement. Fans driven by electric motors will exhaust foul air from the building, each room being provided with a system of ventilating ducts. The building throughout will be heated by steam and lighted by electricity. For the latter purpose, 1,700 incandescent lamps will be required. All the engineering apparatus will be in duplicate, to provide against delays resulting from possible accidents.

The woodwork of the interior is to be of oak, and plate glass will be used on the several fronts; in fact, all of the appointments will be rich and substantial. It is expected that the building can be completed ready for occupancy in September, 1891, when it is proposed to organize the schools. The building and plant will cost about $500,000. Mr. Drexel intends to provide an endowment fund of about $1,000,000 with which to support the work of the institution, making his gift $1,500,000, as originally contemplated.

The Growing Industry.

Whipple's Reports for April show the number of central electric light stations in active operation to be as follows: United States, 1,498; Canada, 87; Cuba, 2; Mexico, 9; total 1,596. There are 1,036 gas companies of which 298 have electric light plants of their own.

A large increase in the number of electric railways is noted, there being 208 in the United States and four in Canada.

Subterranean Photography.

The photographing of caves or other chambers underground where a portable camera can be easily installed, offers no particular difficulty, and it is a comparatively simple matter to obtain curious and interesting views under such circumstances, illuminating the bowels of the earth by burning magnesium tape, which gives a brilliant light, by means of which surrounded objects can be photographed. The apparatus designed by M. Langlois, which we describe below and which is illustrated in the accompanying cut, is adapted, however, to those cases where the facilities for installing the camera in the ordinary manner are absent, and its use is explained by the following description of the unhappy circumstances which brought about its invention.

A landslide, which occurred in the most unexpected manner at the quarry of Chancelade, France, resulted in a number of unfortunate workmen, who were in the subterranean galleries at the time of the accident, being buried alive. It was supposed that the men were entombed in one of the galleries about 220 feet below the mouth of the mine; but nothing certain was known of their position, and in the necessity of proceeding at once to make an attempt at rescue, it was of the utmost importance to obtain some reliable information as to the whereabouts of the imprisoned men so that the operations for their rescue might be directed in an intelligent manner.

A shaft about a foot in diameter was sunk in the direction of the gallery, and while the work was going on, entreaties were made to M. Langlois to construct if it were possible a photographic apparatus which could be lowered through such a narrow aperture and manipulated from the surface.

The clever engineer surmounted the difficulties which presented themselves, designing the apparatus represented in the cut. This instrument is in reality a *camera obscura* of small size, the plate being about two inches square, the focus of the lens being of comparatively short range.

The camera is mounted in a metallic case or tube, open on one side, the tube being lowered through the shaft by means of a chain. The camera is pivoted within the tube at its upper end, so that it can be kept at any angle by means of a cord or small chain attached to the lower part of the camera. Above and below the camera were placed rows of incandescent lamps, and the whole apparatus being lowered, the camera was made to incline outwards from the case. In order to photograph the interior of the gallery, all that was necessary was to turn current on, thereby lighting up the incandescent lamps, the plate being exposed at the same time. In this manner excellent results were obtained from a photographic point of view, the time of exposure being five minutes.

Unfortunately, the good results secured by the use of M. Langlois' apparatus were of no avail in this particular instance, as the unfortunate workmen entombed in the quarry of Chancelade perished from hunger after intense sufferings. This sad circumstance in no way detracts from the usefulness and ingenuity of the instrument we have described, but it is well to relate it here so as to complete the story of the dramatic incident which caused the instrument to be invented.

Electro-motive Force and Insulation Resistance.

Our attention has been called to a series of articles which appeared some time since in our contemporary, *L'Electricien*, says the London *Electrical Review*, and in which M. Lafargue recapitulates the results of certain experiments carried out by M. Förderreuther. The last named gentleman has arrived at the conclusion that the insulation resistance of a cable varies according to the potential of the current applied. M. Lafargue would appear to lend some credence to this opinion, and a contributor to the columns of the *Lumière Electrique* also seems to share this belief.

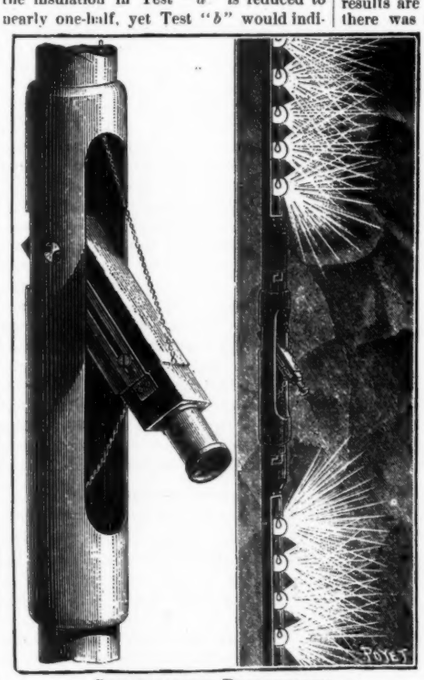
It is scarcely worth while to controvert such a theory, but the support given to the proposition by the publications above mentioned, may serve as a reason for referring to the matter in our columns; at the same time we would disclaim any intention of affronting the intelligence of our readers, by bringing before their notice a subject which, except for the reason above given, would appear unworthy of serious consideration.

To prove his contention, M. Förderreuther gives a table of voltages and their corresponding resistances, showing the following variations:

Volts.	Insulation resistance, megohms.	Volts.	Insulation resistance, megohms.
7.4	11,030	51.6	6,840
14.8	8,1 0	44.8	7,040
22.1	7,700	36.7	7,160
29.4	7,370	29.4	7,370
36.7	7,160	22.1	7,700
44.4	7,040	14.8	8,180
51.6	6,860	7.4	10,500
	(a)		(b)

It is to be remarked that throughout these experiments, the intermediate results, when increasing the voltage (Test "*a*"), correspond almost exactly with the values obtained at similar voltages when decreasing the E. M. F. (Test "*b*.")

It is also worthy of notice, that, although the insulation in Test "*a*" is reduced to nearly one-half, yet Test "*b*" would indicate that no permanent damage to the insulation seems to have been caused.



SUBTERRANEAN PHOTOGRAPHY.

M. Lafargue remarks that there is nothing to be apprehended from the results of this experiment, since the differences obtained in the two tests might easily be due to errors of observation. Yet, although the whole theory is condemned by such a possibility, M. Lafargue claims for the question a certain importance, and actually appears to have come to the conclusion that there is an undoubted fall of insulation due to increase of voltage. Apart from the question of error, such a notable loss as that of nearly one-half the insulation by increasing the E. M. F. from 7.4 to 51.6 volts, is, in any case, a matter of very serious import, more especially since it is attempted, from the results given, to establish the maxim that insulation must naturally diminish as the E. M. F. is increased. Supposing that M. Förderreuther had increased the E. M. F. in his experiments to 100 volts, a very usual voltage on electric light circuits, we should then, according to his showing, meet with a most formidable loss of insulation.

A more reasonable conclusion to arrive at from M. Förderreuther's results would be that a weak point existed in the cable under test, the insulation being considerably more affected by the higher than by the lower voltage. It does not at all follow that because a weak point exists it should immediately develop into an absolute fault, more especially if the cables have been tested under conditions of current, weather, positions, etc., least likely to affect a weak place; under such favorable circumstances M. Förderreuther might easily obtain the results he quotes when reversing the order of voltages, as shown in Test "*b*." But, on the other hand, the remarkable regularity shown in the results would lead one to doubt more the method of testing than the condition of the cable.

To further support the argument, more elaborate experiments are quoted. A sketch is given purporting to show the system pursued in testing, the formula used for working out the results of tests is explained, and a table is made out in which are shown the voltages employed, the deflections observed and the insulation resistances obtained in the course of tests made on several cables. The results given in this table are similar to those already quoted, the insulation in every case decreasing as the electro-motive force is increased.

The cables are tested in pairs, the insulation of each is given separately, and then that of the same cables joined up so as to measure their combined insulations when in series. This last result should, of course, be be equal, within reasonable limits, to the sum of the two measured separately, but in no instance is this the case, the resistance through the double thickness of insulation offered by the two cables, when tested in series, being very much less than that through either one.

The formula is no doubt correct, but on comparing the results given in the table, we find some difficulty in reconciling them. In fact, the only approximately satisfactory results are those obtained on cables where there was next to no insulation; on this basis we might argue, that if there were no insulation at all, the results would have been absolutely comparable.

M. Lafargue, in commenting on these tests and the tabulated results, notices the absence of accordance between them, but instead of attributing the discordance to the proper cause, he apparently accepts the figures and arrives at the remarkable conclusion that no law can be given for connecting the values of the same cables when tested separately and then together.

We are inclined to think that some mistake has been made with regard to the deflections, either in observing or in calculating their values, for by adopting them as given in the table and following the formula, we obtain, in trying to arrive at the galvanometer resistance, a minus quantity. It is evident that a very small error in the deflections would materially alter the result of the calculations of galvanometer resistance.

From these tests a table is made out of the deflections which should correspond to various voltages, given the deflection obtained with a certain E. M. F., and a formula, based on a constant obtained from the tests, is constructed for calculating these deflections. Since the results of the tests would show that insulation diminishes as voltage is increased, any formula based on such an utterly incorrect hypothesis must be valueless. Of course, the voltage can be increased to such an abnormally high point that the insulating material will no longer resist the strain brought to bear upon it, but so long as the cable remains sound there will certainly not be the gradually decreasing insulation which M. Förderreuther attempts to show.

It so happens that we have been able to place our hands on certain tests, made for experimental purposes on some gutta-percha and india-rubber core. The results point to nothing unexpected, nothing new, but are certainly opportune in that they may prove of some value to M. Förderreuther and the adherents to his theory, who may perhaps accept the evidence of accurately effected experiments.

The core was tested in water maintained at a temperature of 75° Fahr.

5.0 NAUTICAL MILES OF GUTTA-PERCHA CORE.

Temperature 75° Fahr.

Volts	= 15	60	150	300	600
Insulation resistance per N.M., megohms	= 1,016	1,027	979	1,048	1,082

3.0 NAUTICAL MILES OF INDIA-RUBBER CORE.

Temperature 75° Fahr.

Volts	= 60	150	300	600
Insulation resistance per N. M., megohms	= 3,190	2,966	2,974	3,105

We would point out to M. Förderreuther that such irregularities as are observable in the above results, are simply due to unmeasurable variations in temperature, and errors of observation.

Austin, Texas.—Taylor Electric Light Company; capital, $40,000.

Parkersburg, Pa.—The Chester Valley Electric Light and Power Company. Capital stock $1,000.

Moundsville, W. Va.—Moundsville Electrical Company; to furnish light, heat and power; capital, $5,000.

East Liverpool, Ohio.—The East Liverpool Western Electric Company, increase of capital stock from $18,000 to $25,000.

Saco, Me.—New England Electric Safety Company. President, Robert C. Wiggin; treasurer, James R. Powers. Capital stock, $100,000.

Milwaukee, Wis.—The Milwaukee Light and Power Company; capital, $500,000; incorporators, W. H. Earles, C. Stolper and John J. Kempf.

Ogden, Utah.—Ogden Power Company; capital, $250,000. The incorporators are Clifton E. Mayne, O. D. Banks, J. J. Sullivan and E. M. Allison, Jr.

St. Louis, Mo.—The Automatic Electric Exchange Company has been incorporated; capital stock, $100,000; incorporators, W. R. Ford, H. Overstolz and A. Leslie; object, the manufacture of electric apparatus.

Camden, N. J.—The Southern Electric Heat and Power Company, with a capital of $50,000. Among the incorporators were Cornelius Haggerty and William J. Manning, of Philadelphia, and Isaac C. Doughten, of Camden.

Hartford, Conn.—The Forest City Railroad Telegraph Construction Company has been recently formed. Its purpose is to equip railroad and telegraph lines in South Dakota and elsewhere. The company has a capital stock of $50,000, divided into 1,000 shares of $50 par value. Gen. William H. Bulkeley, Joseph L. Barbour and J. H. Turner, of Hartford, are stockholders.

The International Telegraphic Congress.

In the French Chamber of Deputies, recently, says the London *Electrical Review*, the credit of 100,000 francs for the expenses of the International Telegraphic Congress was discussed. M. Labrousse said that there were many buildings in Paris where this Congress could be received, without spending 40,000 francs to alter a hall at the Louvre. M Jules Roche, Minister of Commerce, said that 100,000 francs was not an excessive sum. This Congress was of great importance. Five years since, it was received in Berlin with an ostentation which it was not intended to imitate; still, the reception must be suitable. M. Clémenceau proposed a reduction of 30,000 francs. M. Bastid, reporter on the measure, said it was urgent to vote the credit for a Congress which opened in May. The Budget Commission could only invite the Government to seek a less costly instal lation; but it was proper to leave it a certain margin. He asked that the matter should be referred to a committee, which was agreed to. On the following day the credit of 80,000 francs was adopted by 198 against 0.

The Spanish colonies of Cuba, Porto Rico and the Philippines, will apply for admission to the International Union. Negotiations are on foot between the Spanish Government and the telegraphic submarine companies in these colonies, with a view to the establishment of more favorable tariffs.

The conference opens on the 5th of May, in Paris, the riding school of the late Prince Imperial, at the Louvre, being the place chosen for the meeting.

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CONTENTS.

	PAGE.
The City Lighting	1
The Clark Automatic Safety Device	1
American Names for Electrical Units	1
Removal Notices	1
General Electrical Notes	1
Electro-Technical Exhibition at Frankfort-on-the-Main	2
A Solid Steel Car Wheel	2
Anything But Lightning	2
Welding Tires and Axles by Electricity	2
The Edinburgh International Exhibition, 1890	2
Mica	2
Drexel Industrial Institute	2
The Growing Industry	2
Subterranean Photography	3
Electro-motive Force and Insulation Resistance	3
New Corporations	3
The Lighting of New York City	4
Muzzling the American Eagle	4
Correspondence:	
Our Boston Letter	5
Our Chicago Letter	5
Our Washington Letter	5
Our St. Louis Letter	5
The Retort Courteous	5
Telephonic News	6
Contracts Made by Telephone	6
Professor Aron's Electricity Counter	6
Rapid Telegraphy	6
Moet et Chandon	6
The Admiralty Dynamo Specifications	7
Defending Western Union	7
Electric Power	8
The Essick Printing Telegraph	8
American Society of Mechanical Engineers	8
The Smit Combined Engine and Dynamo	8
Personal	8
The Humorous Side of It	8
The Lenox Lyceum Exhibition	8
The Thomson Electric Welding Process	9
The Cartwright Protector	9
Electric Light News	9
Kindred Interests	10
What's the Matter with "Ride"?	10
Electric Clubs:	
Chicago Electric Club	11
Boston Electric Club	11
New York Electric Club	11
Electrical Patents	11

INDEX OF ADVERTISERS.

COVER PAGES.

Ansonia Brass & Copper Co	4
Armington & Sims	4
Bridgeport Brass Co	4
Brush Electric Co	3
Davis, Charles H., Electrical Engineer	4
Day's Kerite Insulated Wires	4
Eastern Electric Cable Co	4
Edson Pressure Recording Gauges	4
Hampson & Co., E. P.	4
Jewell Belting Co	4
Moore, Alfred F	4
Okonite Co	4
Simplex Electrical Co	4
Standard Underground Cable Co	4
Tucker Electrical Construction Co	4
United Edison Manufacturing Co	2

INSIDE PAGES.

Aluminum Battery Electric Light & Power Co	18
American Bell Telephone Co	20
American Electrical Works	12
Babcock & Wilcox Co	26
Baird & Co., Henry Carey	11
Baker & Co	12
Ball Electric Light Co	19
Ball Engine Co	20
Baxter, H. E. & C	24
Blanchard, C. M	12
Brownlee & Co	26
Brush Electric Light and Power Co	23
Buckeye Engine Co	13
Burton Electric Co	11
Butler Hard Rubber Co	14
Cary & Moen	26
C, B. & Q. R. R	23
"C. & C." Electric Motor Co	14
Central Electric Co	26
Clark Electric Co	12
Cleveland, W. B	28
Continental Dynamo Co	18
Cowles, Eugene H	11
Cutter, George	12
Daft Electric Light Co	21
Dwight Slate Machine Co	26
Easton Electric Co	17
Eclipse Wind Engine Co	13
Eddy Electric Manufacturing Co	28
Edison Machine Works	24
Edison Lamp Co	26
Edison Manufacturing Co	14
Edwards, S	11
"Electric"	11
Electric Gas Lighting Co	18
Electric Safety Co	25
Empire China Works	13
Empire City Electric Co	17
Eugene F. Phillips Electrical Works, Ltd	12
Eureka Tempered Copper Co	22
Excelsior Electric Co	21
Faraday Carbon Co	23
Fort Wayne Electric Co	28
Garvin Machine Co	13
Gassner's Dry Battery	24
Gethins Electrical Manufacturing Co	20
Gibson Gas Fixture Works	13
Goodrich Rubber Companies	22
Gordon & Co., W. H	12
Greeley & Co., The E. S	23
Hammond Typewriter Co	19
Holmes, Booth & Haydens	21
Horn, Brannen & Forsythe Manufacturing Co	20
Ide & Son, A. L	28
"Industries"	24
Interior Conduit and Insulation Co	18
Jarvis Engineering Co	13
Lane & Bodley Co	22
Leclanche Battery Co	13
Leffel & Co., James	26
Lehigh Valley Creosoting Co	20
Lynch, E. T., Jr	12
Macfarlane & Co., Wm	13
Marshall, Wm	11
National Carbon Co	19
National Tel. Manufacturing Co	11
Newark Machine Tool Works	14
New England Butt Co	13
New York Belting & Packing Co	22
New York Electric Supply Co	12
Ostrander & Co., W. R	20
Page Belting Co	11
Palermo Mica Co	26
Parker-Russell Mining and Manufacturing Co	22
Partrick & Carter	17
Pennsylvania Railroad	19
Phœnix Glass Co	12
Phosphor-Bronze Smelting Co., Ltd	22
Pond Engineering Co	13
Post, Jr., & Co., John	13
Proposals for Street Lighting	11
Proposals for Supplies	11
Queen & Co., James W	12
Railway Directory Publishing Co	23
Rice Automatic Engine	13
Ricketts Co., Limited (F. M.)	22
Royce & Maresan	22
Sanley & Co., W. R	23
Sawyer-Man Electric Co	27
Schoverling, A	24
Schuyler Electric Co	25
Seely & Taylor Manufacturing Co	24
Shultz Belting Co	13
Southern Electrical Supply Co	17
Solar Carbon and Manufacturing Co	28
Sperry Electric Co	22
Sprague Electric Railway & Motor Co	20
Stephenson Co., Ltd	24
Stevens & Babcock	22
"Street Railway Journal"	19
Taber, Arthur H., Agent	11
Thomson-Houston Electric Co	16
Trinidad-Heimann Insulated Wire Co	19
Tropical American Telephone Co., Ltd	19
Vincent & Co., Charles R	13
Wainwright Manufacturing Co	28
Washburn & Moen Manufacturing Co	23
Watson & Stillman	20
Western Electric Co	14
Westinghouse Electric Co	15
Whipple Co., Fred. H	18
Williams & Potter	13
Wilson & Co., R. D	11
Wyckoff Pipe Co	12

The New York Electric Club is a model organization of its kind, and its *cuisine* ranks with that of the best hostelries in the metropolis. It is quite remarkable, too, what a headquarters and rendezvous it has become for electrical men and their friends.

Capitalists have come to realize the fact that the electric railway is the greatest developer of urban and suburban property known. With this idea, a syndicate has just decided to improve Salt Lake City with $500,000 worth of electric railways.

Our esteemed and witty contemporary, *Judge*, in its issue of April 26th, set forth a pictorial phonograph joke. We should advise the editor of the art department to send his artists to the Lenox Lyceum Electrical Exhibition so that they may learn what a phonograph really looks like. It is not a cigar box with a tin funnel stuck in the top.

The Senate investigating committee has at last got down to discussing the effects of the imperfect gas mains in the streets of this city upon the subways and manholes. One witness stated that in some portions of the city, if a crow-bar were run into the ground, enough gas could be found to make quite a respectable flame. Subways, in themselves, are just as safe as railroad tunnels; it is only when abnormal conditions exist that they become in any degree dangerous. Give us perfect gas mains and the manholes will take care of themselves.

The first case of execution by electricity occurs at Auburn, N. Y., some day this week, by means of an electric-steam plant costing over $5,000. Probably by the time this journal reaches its readers the deed will have been done.

Call it "Henry!"—the electrical unit of self-induction! Let every American electrician accept and advocate this recommendation, many foreign electricians will join them, and the Conference of 1892 will finally ratify their choice.

A French contemporary evidently does not believe in the republican simplicity of American scientists. In a report of the lecture on acoustics recently delivered by Professor Cross, at the Electric Club, we find Professor Le Conte Stevens, of Brooklyn, designated as "le comte Stevens."

We are accustomed to hear of ocean cables being laid down in enormous depths, sometimes amounting to a mile or two below the surface of the water, but it is not often that a telegraph station is established at a corresponding height up in the clouds. A provisional telegraph station recently equipped by the telegraph corps attached to a military expedition in India, is located at Buttong, in the Himalayas. Buttong is situated at an elevation of 14,600 feet above the level of the sea, and it is pretty safe to say that dots and dashes have never before been dispensed from such an extremely elevated position.

The Italian electrical paper *l'Elettricita Italiana* has published a curious and interesting document, procured by it through the good graces of the Reverend Dom Antonio Pagani. This extraordinary statement is signed Alexander Volta, and proves once more the oft-repeated truism that genius is invariably lacking in the power to attract the generosity of governments towards those endowed with it. The document in question, bearing the autograph of Alexander Volta, is written on a sheet of paper bearing a government stamp; it is dated at Coma, the 2d of July, 1820, and runs as follows:

"I, the undersigned, Alexander Volta, declare on solemn oath, that I receive no salary or pension from the government other than that of member of the Institute of Arts and Sciences."

THE LIGHTING OF NEW YORK CITY.

The lighting of a great city like New York is a matter of vital interest, and the statements made in another column in regard to this question are especially pertinent just at this time. It will be remembered that the city authorities, after imposing conditions upon the electric light companies which necessitated an increase in the cost of production, refused to consider the bids made by these companies for furnishing the city with electric light.

As shown in the figures of the statement alluded to, it will cost the companies 11.2 cents more per lamp per night to operate their circuits underground than it did to furnish current from the overhead wires. The price paid by the city, when the overhead circuits were used, was 35 cents per lamp per night. Now, when the cost of production is increased 11.2 cents per lamp per night by requiring the service to be carried in subways, and the electric light companies only ask an increase of 4 cents, or 39 cents per lamp per night, the bids are refused and the Board of Gas Commissioners awards the contract to the gas companies.

The contrast between the illumination of this great metropolis by gas and by electricity will be the best argument in favor of a speedy return to the arc lights. Bearing in mind the consternation caused a short time ago when the overhead wires were cut and the city was thrown into a state of semi-darkness, out of which the sickly gleam of the old gas lamp could be dimly discerned, and the fact that in many districts it became necessary to double the police force, we do not believe the city authorities will have the courage to brave public opinion to such an extent as to utterly wipe out the illumination of New York City by electricity.

MUZZLING THE AMERICAN EAGLE.

We hear a good deal of protection in this country, but matters are scarcely carried so far in this direction as is the case in France, judging from the recent action of the Paris municipal council regarding the electric lighting of that city.

It appears that the material used in the installation is to be entirely of French manufacture. The contractor, M. Popp, has seen fit to disregard these conditions, and has been called summarily to account in consequence.

In order to put a stop to the use of foreign machinery in electric lighting installations on French soil, the council, in spite of opposition on the part of some of its members, voted that all engines and machinery of foreign manufacture used in electric light stations should be replaced by French machinery within three months. In the case of compressed air machinery, one year is allowed to make the change, but foreign machines of this kind are not to be kept at work.

Current produced by foreign-made machinery shall not be permitted to pass through the mains and connections belonging to the private house and store service.

The contractor is requested to furnish plans of all stations and their corresponding mains and distributing connections; no station is to be connected to the mains of another, and the mains for the public and private lighting are to be kept entirely distinct. Current from the Thomson-Houston machines is not to be used for the private service, and connection between the stations and the mains will not be permitted until the committee is satisfied that all the material is of French origin.

These cast iron rules are certainly rather hard on the contractor, who, probably, in some instances, can fill his needs better abroad than at home. As an instance of narrow-mindedness they decidedly stand unique, and, what hurts our feelings most of all, constitute a vigorous effort to muzzle the American eagle, which noble bird has been screaming abroad lately to a considerable extent.

No one should miss the electrical exhibition now in progress at the Lenox Lyceum. It is a remarkably beautiful display of electric lighting. The whole of the Paris Edison exhibit, besides many additional features, is shown. The feats accomplished by means of the long distance telephones, are a constant surprise to visitors, and this portion of the exhibit is worth spending a whole evening over. On May 15th the exhibition will close, and it is impossible to predict when such another exposition of the wonders of electricity will be available to the public.

These electric light troubles have done the people of New York at least one good service, in giving the Mayor and two or three other gentlemen a chance to exhibit themselves in their true characters. The Mayor has hinted at a "combine" on the part of the electric light men, but has not inconvenienced himself so far as to prove anything. Does any one suppose the increase in cost of electric lights a few cents a night was the sole reason for the Mayor refusing the bids?

We should respectfully but firmly advise Mayor Grant to emulate the example of the ambitious anaconda, and "restore himself to himself and resume business as heretofore."

The phonograph people have property which grows more valuable with the lapse of every year. Many cylinders are stowed away with marvelously interesting records upon their waxen surfaces. The Gladstone cylinder is exhibited only on rare occasions and to distinguished guests. It is already an extremely valuable record, and at Gladstone's death it will probably be worth $1,000. A cylinder containing a few sentences by old Gen. Von Moltke, now 90 years of age, is occasionally set going. A less valuable, but not less curious, cylinder gives the choking sobs of a German infant whose wails were caught in Berlin, last December. Funny stories by Eli Perkins, songs by well-known singers, short passages from current plays and like things, are all on storage in phonograph cylinders and brought out now and then. These cylinders lose nothing in clearness and volume from the lapse of years, but, of course, may be worn out from use. Mr. Edison believes that a record taken to-day and carefully preserved can be reproduced 250 years hence.

CORRESPONDENCE.

Electrical Happenings in Boston, Chicago, Washington and St. Louis.

OUR BOSTON LETTER.

The New England Telephone and Telegraph Company has commenced work on a new telephone line from this city to Fitchburg, Mass.

An Electric Railway is projected at Quincy, Mass. Steps have been taken to get the company organized at once.

"Samson" Battery seems to be in demand, judging from the single order of 3,000 cells of the battery named received by the Electric Gas Lighting Company this week.

A Central Station for furnishing incandescent lights for a number of summer cottages is among the new enterprises contemplated at Newport, R. I.

Mr. M. M. Kimball, of this city, firm of Claflin & Kimball, the agents of the Mather Electric Company, has returned home from a European trip.

The Economic Electric Company's factory, at Brockton, Mass., is nearing completion, a large quantity of new machinery having been placed in position. Quite a number of men are already employed and ere long the number will be more than doubled.

Milford, Mass., will soon have an electric railway. Preliminary surveys of the proposed line for the Milford and Hopedale Electric Street Railway were made April 22d.

The Tropical American Telephone Company reports having just received an order from Brazil, S. A., for 500 complete sets of the company's standard telephones.

The Emerson Power Scale Company, of this city, has removed from its temporary quarters, No. 55 Oliver street, to new and commodious offices at No. 12 Post Office Square.

Storage Battery Plant.—The residence of Mr. Fred. L. Ames, at North Easton, Mass., is to be lighted by electricity by storage batteries. The New England Construction Company has charge of the work now in progress. The dynamos will be at the Red Mill and water used as the motive power.

Mr. Samuel E. Elder, who has been identified with several electrical enterprises inaugurated in Boston, has been appointed an agent of the Brush Electric Company and to be associated with Mr. John E. Ridall in the Western district of Pennsylvania.

Tripp Anti-Friction Journal.—All the cars on the new electric street railway now under construction at Concord, N. H., will be mounted on trucks supplied by the Tripp Manufacturing Company, and will be fitted with their special journal bearings which are exciting so much interest and coming into such general use throughout the country.

The Connecticut Motor Company, of Parksville, Conn., reports the following sales for current week: One 10 h. p. for Boston; one 1 h. p. New York and Scranton; one ½ h. p. and one 5 h. p. Philadelphia; one 5 h. p. Rochester and one 3 h. p. Cincinnati, Ohio. They also report inquiries for 14 two h. p.; 20 one h. p. and 20 one-half h. p. motors.

New Isolated Plant.—Messrs. C. F. Hovey & Company, of this city, have purchased an electric light outfit for illuminating their large establishment with arc and incandescent electric lights. The Thomson-Houston system will be used, furnishing 30 arcs and 250 incandescents. The Evans Friction Cone system will be used to drive the two dynamos.

The American Waltham Watch Company, one year ago, were making 1,500 watches per day, and at the present time the company's average daily product is 1,750. Of these watches, one year ago, 250 were non-magnetic, to-day the company turns out over 500 perfect non-magnetic watches. Twenty-eight hundred people are employed by the company, the weekly pay roll being $16,000.

Boston Society of Arts held its regular Thursday evening meeting, April 24, at the Massachusetts Institute of Technology. Mr. F. M. Gilley, of Chelsea, then read a paper on "Central Electric Light Stations in London." The paper was illustrated by many interesting lantern views from photographs taken by Mr. Gilley during his trip abroad.

The Electric Mutual Insurance Company, of this city, has decided not to issue any policies until May 15th. The company's action is easily explained by the fact that it has already risks in hand representing upwards of $2,000,000 worth of property, and it has been deemed the most wise and equitable plan to issue all policies simultaneously on the date named.

The Electrical Safety Company has already sold territorial rights for this section to a company composed of several well-known and wealthy New England gentlemen. In conversation, recently, with one of the officers of the company, it was stated to me that "the words, 'Electrical Safety,' used in connection with the company's business, originated with this company, and that they can justly claim the exclusive right to its use."

The New Electric Light and Power Station at Attleboro', Mass., built by the North Attleboro' Steam and Electric Company, is finished, and the entire equipment ready to start up. The station is fitted up with the Evans system of friction cones.

Union Switch and Signal Company, of Swissvale, Pa., through its Boston office, has been awarded a contract by the Boston and Albany Railroad Company, for 34 additional automatic rail circuit block signals, to be installed between Worcester and Springfield, Mass. Manager Chas. A. Scott, of the company's Boston office (Hathaway Building), reports "that there is an encouraging outlook for the general use of his company's signal on the New England railroads."

The New England Electric Company, sole agent for this section of the Sprague Electric Railway and Motor Company, has removed from its old Oliver street quarters to new offices, No. 12 Post Office Square. The officers of this well-known and enterprising company are George F. Steele, president, and Edward Blake, treasurer and general manager.

The New England Printing Telegraph Company, of this city, is negotiating with the Boston Police Board to connect up the headquarters of the department with all the police stations in the city and suburbs by means of the "Essick Printer." This will, in the event the system is adopted, enable the officers at headquarters to notify all stations simultaneously. The company has made arrangements to build a line of ten wires between Boston and New York city, and this line will be in working order before September 1, and it will probably prove the precursor of a general printing telegraph system throughout the country. The much talked about test to be given by this company before a number of United States officials, will take place May 1. By that date the company will have line facilities between Boston, New York and Washington.

Boston Electric Cars.—The board of aldermen have at last decided to permit the electric cars to increase their rate of speed as follows: From seven to 10 miles an hour, between Westchester Park and Pleasant street; and from Westchester Park out through Dorchester, Roxbury and other points in the suburbs, the speed is limited to 12 miles an hour.

Boston Electric Club.— Mr. George W. Mansfield, electrical engineer of the Thomson-Houston electric railway department, will, on Monday evening, April 28, read before the members of the Club a paper on "Single and Double Trolleys for Electric Railroads."—The ladies' night on last Wednesday evening was the greatest of all the pleasant social gatherings within the experience of the oldest members. The occasion being the first ladies' night, most of the members joined hands with the house and entertainment committtee to make the event not only enjoyable but memorable; and it was gratifying to those who worked the hardest to note that the occasion was successful to a degree far beyond their expectations. Nearly 200 ladies and gentlemen responded to the invitations; and over one-half that number were ladies. The assembly and billiard room had been made more brilliant than usual by additional electric lights; the fixtures and fancy shades having been kindly loaned the Club by Mr. J. R. Magee, manager of the isolated department of the Thomson-Houston Electric Company. Mr. Magee also contributed several attractive pictures, and the thanks of every member of the Club is due to that gentleman and to Messrs. Geo. W. Mansfield and H. B. Prindle, also of the Thomson-Houston Electric Company, for their generous contribution of engravings, photographs, etc. Mr. Arthur B. Griggs kindly loaned his large and magnificent collection of birds. The Edison Phonograph Doll Company contributed two handsome talking dolls. The New England Phonograph Company, one of their largest instruments, which discoursed vocal and instrumental music. The Edison Electric Illuminating Company loaned a model of their improved dynamo. The Crocker-Wheeler Company, of New York, through a Boston friend, also loaned one of its handsome and nicely working motors. The flower decorations were superb, and filled the air with rich perfume. The steward of the Club furnished the banquet; and to his credit be it said that, as on all other occasions, he proved himself to be a first-class caterer.

Electric Stocks.—Boston quotations at closing hour of the Exchange, Saturday, April 26, were as follows:

Thomson-Houston Electric Company	56¼
" " " " Preferred.	25¾
" " " " Series C..	16¾
" " " " Series D .	7⅝
Thomson Electric Welding Co	225.
" European Welding Co	123½
Westinghouse Electric Co	42½
Fort Wayne Electric Co	14¾
Edison Phonograph Doll Co	7¾
TELEPHONE:	
American Bell	223.
Erie	42¼.
New England	50.
Mexican	.95
Tropical American	.80
National Tel. Mfg. Co. (acoustic)	.65

Boston, April 26, 1890. W. I B.

OUR CHICAGO LETTER.

The Thomson-Houston Company report the following sales: Atchison Gas, Light and Power Company, 300 direct incandescent lights; Aurora Electric Light and Power Company, 35 arc lights; Electric Light Company, Clinton, Iowa, 1,000 alternating lights (increase); Carroll & Powers, St. Louis, entire lighting outfits for two steamboats, also Thomson-Houston focusing lamps, together with head-lights and reflectors; Standard Stamping Company, St. Louis, 200 direct incandescent lights.

The Edison Electric Light Company, Detroit, Mich., are building a sub-station in the resident district. The Brush and Detroit Electric Light and Power Company are making preparations to furnish light in the same field.

An Edison Phonograph has been placed in the Rotunda of the Sherman House, where visitors may be treated to a concert by Appa's band for the sum of 10 cents.

Personal.—G. A. McKinlock has returned from an extended trip through the West. Edward Lasell, president of the Southwestern Electrical Supply Company, of Kansas City, Mo., was a recent visitor in the city. H. M. Lufkin, of the "C & C" Motor Company, spent a few days of this week in Chicago.

The Central Electric Company's pin and bracket factory, at Columbia City, Ind., is taxed to its utmost in filling recent orders, mostly for electric light installations. The above company have been testing the Edison-Lelande battery for the past four weeks and are obtaining excellent results which will make a good record if maintained the full time. The central is putting in a large stock of small motors especially designed for sewing machines, fans, ice cream freezers and all small work. Power for these motors is furnished by batteries, for which some great claims are made.

The Highland Park Electric Light Company, Highland Park, Ill., has been fully organized and has just completed contracts with the Thomson-Houston Company for its plant. Work on the station will commence at once.

J. H. Reid, western representative of the Mather Company, has closed a contract to furnish 1,600 incandescent and 10 arc lights for the new opera house, Denver, Colo., also a contract for 1,000 incandescent and 70 arc lights for Harnon and Hogg, to be used in lighting their saloon and theatre, 83 Madison street. The arcs will be of the Easton system.

J. E. Wilson has been appointed general western agent for J. A. Grant & Company, of Boston, and will have charge of their Chicago office. Mr. Wilson succeeds Mr. H. A. Glasier, lately deceased.

Mr. Henry B. Stone, on June 1st, will sever his connection with the C., B. & Q. R. R., and fill the position of president of the Chicago Telephone Company. Mr. Stone is a young man of marked ability, which is plainly shown by the rapid advances made by him while with the Burlington road, advancing from a position in the shop to the position of second vice-president.

The Hill Clutch Pulley Company will, on May 1st, remove their Chicago office from its present location, on Canal street, to Room 333, Rookery.

Messrs. C. C. Warren, H. McL. Harding and J. L. Barkley, who have been connected with the Sprague-Edison Company, in Chicago, are now prominently identified with the new Westinghouse Electric Railway Company, lately organized in Pittsburgh, Pa., with a capital stock of $2,500,000. The offices of the company will be located at New York and Chicago, and the former will be under the charge of Messrs. Barkley and Harding, while Mr. Warren will have control of the Chicago office. D. B. D.

April 26, 1890.

OUR WASHINGTON LETTER.

The Amendment to the Eckington Railroad charter, authorizing the extension to the Treasury Department, has finally passed the Senate and House of Representatives, and will, without doubt, be approved by the President. The company is prepared to build the extension at once and will, it is expected, operate it with storage battery motors. Overhead wires are not allowed in the part of the city which it traverses; a cable road is out of the question; the company has no horses or stables; underground wires are not promising, and accumulators seem to be the only dependence.

Work on the Construction of the experimental street railway in Washington, to be operated by the Judson Pneumatic System, is to be commenced in two weeks and the projectors say the road will be running before the summer ends. It will be about two miles long.

The Chesapeake and Potomac Telephone Company has changed its rate of dividend from five per cent. to three per cent. in order to devote a large share of its profits to the payment of construction expenses.

The American Telephone Company, which operates some exchanges in Venezuela, recently elected the following officers: President, Ex-Senator D. M. Sabin; treasurer, H. Browning; secretary, Frederick G. Norris, all of Washington, D. C.

"Nothing Inconsistent with Integrity and Good Faith," is the statement of the legal aspect of the exploitations of Messrs. Garland, Young, *et al*, as members of the Pan-Electric Association, as announced by Judges Cox, Hagner and James, on the 21st. In this decision the court seems to have attempted to defend the public reputation of the distinguished gentlemen, as well as to determine their legal responsibility in the case before it. We do not question the wisdom or justice of the eminent men composing the court, but their opinions will not alter the judgment which the public long since passed upon the acts of the "Association," and which has been well stated by one of its members, "that every one of us ought to be taken out and hanged for making such d—— fools of ourselves." The Attorney-General of the United States of America, writing formal legal opinions to sustain patents belonging to an organization of which he was a member; taking an active part in the commercial business of that organization; using the funds of the government and the power of the department of justice to cancel the patents of his company's competitors; finally refusing to allow the sale of his company's stock because he doubted its value, while, at the same time, he authorized others to sell less valuable stock, and put his share of the proceeds in his own pocket; holding his position as the representative of undefiled justice at the head of the nation, until the whole administration had to be voted out of existence. This is "*not inconsistent with integrity and good faith!*" G. C. M.

Washington, D. C., April 26, 1890.

OUR ST. LOUIS LETTER.

In Consequence of the recent action of the city council in granting electric motor power to most of the street railroads of this city and in allowing them down town facilities, several of the lines have taken the matter up quite actively. The Union Depot Line is rapidly extending its electric branch, now only running as far east as Chouteau avenue, to its down town terminus at Fourth and Pine streets. The lately erected power plant of this line embraces two Hamilton Corliss engines of 275 horse-power each and six dynamos of the Thomson-Houston system, with a total capacity of 600 horse-power.

The Missouri Railway Company is considering the Thomson-Houston system for its Laclede avenue and Market street branches. The Mound City Railroad is on the eve of changing its power to electricity.

The Motor Company, with James Campbell, Emerson McMillan, J. C. Van Blorcom, John Scullin and Robt. McCullough, as its incorporators, has been organized. Its object is to equip the Benton-Bellefontaine Street Car Line with electric power.

The Estimated Cost for city lighting, as made out by the Supervisor of City Lighting, for the year 1891, is $329,020.48.

The Validity of Contracts Made by Telephone was tested recently in the courts here, and it was decided that such contracts were binding.

Trade Notes.—The Pond Engineering Company will furnish and erect in the Washington apartment house, Kansas City, Mo., an 80 horse-power Armington & Sims engine for their electric lighting plant. They will also place a Lowe feed water heater in the same building. They have a strong demand for the Thomson steam indicator. The city of St. Louis has purchased three. Every cable and electric railway in this and Kansas City have been equipped with a complete outfit, and the city of Chicago supplied with them for testing purposes.—The Southern Supply Company report a very bright outlook from Southern Missouri, Arkansas and Texas, where the electric business seems to have a "boom."—Mr. Skidmore, agent here for the Parrish & Peck Electrical Company, of Detroit, reports the adoption of their electrical signal by the Union Pacific Railroad, and the completion of a full eight coach train for the Missouri Pacific Railroad.—The Cincinnati Electric Engine Company have placed an agency here.

East St. Louis, Ill.—The Citizens' Electric Light Company is stringing its wires preparatory to lighting buildings by the incandescent light. They expect to be ready by May 1st.

Sedalia, Mo.—The Sedalia Electric Street Railway is laying its tracks now. This inaugurates motor electricity in this city.

April 26, 1890. W. H. B.

The Retort Courteous.

To the Editor of the New York Times:

I read in some of the morning's papers the disparaging remarks attributed to Mayor Grant in reference to my opinion as to the insulation of electric wires, with some surprise, because I should have expected that professional courtesy among experts would have led his Honor to treat my opinion as to the insulation of wires with as much respect as I should have given to his opinion concerning the pulling of the same.

HENRY MORTON.

Stevens Institute of Technology, Hoboken, N. J., Thursday, April 24, 1890.

Telephonic News

*** The Assembly has killed the Kerrigan and the Sullivan bills reducing telephone charges in New York.

*** "Give me 2,367," shouted Cumso into the telephone.

He repeated it six times unsuccessfully, and then Fangle suggested:

"Try a smaller number first, and gradually work up."—*N. Y. Sun.*

*** A well-known telegraph man, who has been in heretofore antagonistic relations to the Western Union, says that that company is doing a wonderfully profitable business, and that its forthcoming statement will make one of the best showings in the history of the company.

*** Last week, at a meeting of the Chamber of Commerce, of Helena, Ark., a resolution was passed recommending the passage of the Postal Telegraph bill. This meeting was held at the solicitation of the New York Board of Trade, which communicated with Mr. J. W. Clopton, president of the board, in order to get an expression of the Helena chamber. The resolutions were sent to the representatives at Washington.

*** Where a contract for the transmission of a telegraphic message to a point within the State of Indiana was made in another State, the Supreme Court of Indiana held (Rogers *vs.* Western Union Telegraph Company) that the Indiana courts would not enforce the statutes of the other State prescribing penalties for failure to transmit, and that an action could not be maintained under the Indiana statutes for a failure to deliver after the message had been transmitted.

*** The state tax which has been levied upon the telegraph and telephone companies in Maine for the present year is 2½ per cent. on their valuation, and will amount to $7,850, not so much by $75 as it was last year. The governor and council, in their assessment of this tax, fixed the valuation of these companies as follows: Maine Telegraph Co., $50,000; Western Union Telegraph Co., $125,000; Great Northwestern Telegraph Co., $5,000; Eastern Telegraph Co., $18,000; International Telegraph Co., $50,000.

*** The Bell Telephone Company reports, for the month just passed, a net increase of 799 instruments over last year. Below is the comparative statement for the month ended April 20, and four months of the fiscal year:

Month April 20.	1890.	1889.	Inc.
Gross output	6,062	5,314	748
Returned	1,892	1,934	*51
Net output	4,170	3,371	799
Since Dec. 21.	1889-90.	1888-9.	
Gross output.	18,881	17,803	1,078
Returned	8,042	7,619	423
Net output	10,839	10,184	655

*Decrease.

*** The Boston News Bureau says: "The Erie telephone directors will meet next week to consider the question of dividend for the quarter ending with March 31. Commencing with this quarter the American Bell Company participates in its proportion of the company's earnings. The company will continue its regular one per cent. dividend with the American Bell Company in participation and still show a small surplus. Erie has a cash surplus of $70,009, and since October, 1889, its various sub-companies have increased their list of subscribers something like 500." The following is a statement of the business of the New England Telephone and Telegraph Company, for quarter ending March 31, 1890:

Gross receipts	$334,039 26
Expenses	240,885 35
Net earnings	$93,153 91
Construction	42,927 98
Balance	$40,225 93

Contracts Made by Telephone.

AN IMPORTANT DECISION.

Judge Valliant, of St. Louis, recently rendered an important opinion in a case in which the Paddock-Hawley Iron Company sued Augustus Pullis *et al.*, for $572.34, and in which the plaintiffs received judgment, and a motion for a new trial was made by the defendant. The contract was made by telephone. Herein the interest lies.

"Contracts by telephone," says the Court, "when proven, are as binding as any other contract; but the practical difficulty lies in the uncertainty of the proof, and this uncertainty is chiefly on the point of identifying the person with whom the witness held the telephonic communication.

"When a message by telephone has been received, there are many circumstances which may indicate who the person is that has spoken. But while some of these circumstances have been shown, there is no proof as to who the person is. It has, for example, been held that testimony of a witness to the effect that he was in the habit daily of having communications by telephone with a practical person, knew the number of the telephone and recognized the voice of the person, was evidence tending to prove the identity of the person who was in that case alleged to have made the contract. In this case at bar the defendant's testimony was to the effect merely that he called by telephone a number and asked who it was, and the answer came back that it was the Paddock-Hawley Iron Company. Prices were discussed, but no attempt was made to identify the person at the telephone who made the contract. Even if there had been no testimony to the contrary, this would not have been sufficient to justify the conclusion that it was the plaintiff.

"It has never been held, as far as I am aware," continues the Court, "that a telephone message merely purporting to come from a certain party, but with no evidence of identification, was binding on such party.

"In this case, however, the evidence on part of the plaintiff was positive to the effect that there were but two men connected with the plaintiff's concern who had authority to make such contracts, and that neither of them ever heard of this telephone communication until after the controversy arose. By rules of evidence applicable to this case the plaintiff is entitled to recover, and motion for new trial overruled."

Professor Aron's Electricity Counter.

Our illustration shows the "Electricitäts Zähler," designed by Prof. H. Aron, of Berlin. It is made for direct, alternatiog and three to nine wire currents, the variations being in the coils shown in the left hand lower corner. The one represented here is a coulomb counter for direct currents.

This apparatus consists, in substance, of two clockworks worked into one another, and so regulated as to give the two pendulums synchronous oscillation. The left hand pendulum is of usual construction; the right hand pendulum carries as weight a steel magnet, both pendulums acting jointly upon one dial train.

As long as no current passes through the counter coil, fastened below the magnetic pendulum, both pendulums swing synchronously and the dial train is idle. As soon as current passes through the counter, the magnetic pendulum is affected and swings the faster the more current passes and the difference in the oscillations of the two pendulums is registered on the dial train.

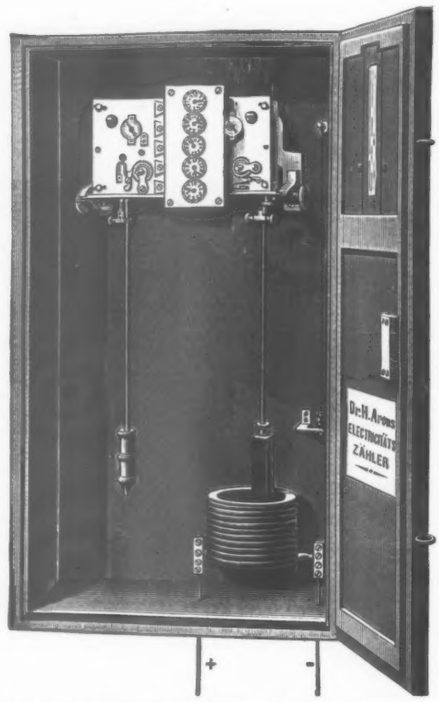
The dial train is so arranged that the top dial indicates the units, the second the tens, the third the hundreds, etc. In order to ascertain the quantity of current consumed, it is only necessary to multiply the number of degrees recorded by the constant determined for each counter.

The clockworks run for about 40 days, thus requiring winding but once a month.

All counters measure correctly the current for any fraction of an ampere up to their capacity, thus, for instance, a counter for 1,200 amperes records correctly the consumption of current of even one single incandescent lamp.

The loss of tension, owing to the inclusion of the counters in the circuit is, considering the small resistance in the counter coils, very minute; thus in case of a counter of 100 amperes at full charge, about 0.05 volts.

W. Hackenthal, 21 Beekman street, is the United States agent for these instruments.



PROF. ARON'S COULOMB COUNTER FOR DIRECT CURRENTS.

At an immense citizens' mass meeting last week, under the auspices of the Chamber of Commerce, for the purpose of discussing matters for the advancement of Salt Lake City and Utah, it was resolved that the city council be requested to grant liberal franchises to electrical railway and other public enterprises, several of which, backed by New York and Boston capital, are seeking the privilege of extending over $500,000 in electric lines, lake resorts, summer hotels, etc. Energetic inauguration of public improvements of all kinds was strongly urged.

Rapid Telegraphy.

"*Apropos* of the fast sending tournament, which took place in New York, a few days ago," said a well-known telegrapher to a St. Louis *Republic* reporter, "it may as well be stated that because Mr. Pollock succeeded in sending 260 words in five minutes, that does not indicate any practical advancement in the speed attained by operators while actually at work on everyday messages or 'specials.' Never before in the history of the telegraph have so many words (52 per minute) been transmitted for five consecutive minutes, it is true, hence Mr. Pollock took the first prize; but not one operator in a thousand could read and copy the matter sent, either with a pen or upon a machine, unless he had previously seen the copy, or, as was probably the case with the man who copied the matter on a machine in New York, familiarized himself with it by copying from those who only made a record of about 200 words in five minutes, and who were called to the test ahead of Mr. Pollock. For high speed and practical results, *The Republic's* leased wire stands at the head of anything in this country, because the senders use a code of abbreviations not used on any other wire, where the receiver spells every word out in full. The Associated Press wires carry a great deal of news in a given time by using common abbreviations, such as any operator understands, but the sending is not so fast but that a first-class operator may copy it with a pen or stylus if necessary. This can not be done on *The Republic's* wire. Here the Phillips code and also the common abbreviations are used, so that it is actually impossible for an operator who has not learned them to read the combinations being sent, and they cannot be followed with a pen. Here are some of the results: Chief operator McGill of the Postal Company, at Chicago, sent 900 words in 14 minutes; W. H. Allen, manager for the Postal Company at Washington, and who used to do some short-hand work for *The Republic*, sending the matter over the wire direct from his hieroglyphics, 5,000 words, in one hour and 45 minutes; Houlder Hudgins, *The Republic's* New York sender, 2,000 words in 30 minutes.

"Here are a few samples of the code: 'I. X. X.'—It is expected. 'I. X. U. 5'—It is understood that the. 'V'—Of which, etc., etc. These combinations are all spelled out in full by the receiver, Mr. I. N. Sharpnack, who uses a Remington machine, and who has accomplished the almost incredible task of doing, on a heavy night not long since, 22,500 words in nine hours. These statements can be verified at any time by any first-class operator who cares to step in and see how much he can read, or how long it takes Mr. Sharpnack to fill up an 800-word sheet.

"The work does not sound fast to an operator, while the 'Morse' is perfect; but the sender, it should be remembered, transmits only an equivalent to about 500 words for every 1,000 words spelled out by the receiver."

Moet et Chandon.

The extensive premises of MM. Chandon and Cie, at Epernay, whence comes the celebrated Moët et Chandon champagne, have been fitted with a complete installation of electricity, both for lighting and for traction purposes, when dealing with the wines. Babcock and Wilcox boilers are employed, supplying steam for three Breguet engines, double cylindered, at 350 revolutions per minute, each driving two dynamos. Three of these dynamos supply current for the light, 250 amperes each, 100 to 115 volts. These are Breguet machines, Pacinotti-Gramme type. Three other dynamos are of the Manchester type, two for transmission of power, 55 amperes, 250 volts, and one for arc lighting, 200 amperes, 70 volts. Roffard motors are used, made by Breguet. The pumps, hauling apparatus, rinsers, etc., are all driven by electricity, while the whole of the premises, including cellars and dwelling-houses, are lighted up, making a most complete and successful installation. A large number of other champagne growers are following suit, and having their own electric installation.—*London Electrical Engineer.*

The Admiralty Dynamo Specifications.

There has been considerable discontent among dynamo makers on the subject of the Admiralty specifications, the temperature clause being generally the center round which differences arise.

The method of testing the temperature seems to be very unsatisfactory. It is specified that, after running for six hours at full load, "no accessible part of the armature or magnets should have a temperature of more than 20° Fahr. above the temperature of the dynamo room." This temperature is taken at the end of one minute after stopping. In many, especially of the more recent specifications, 30° Fahr. is substituted for 20° Fahr. The question that has always puzzled the contractors is: How is the temperature taken? It seems that it is taken by laying a thermometer on the armature or field magnets and seeing what reading it gives. But it is clear that the apparent temperature, as given by a thermometer under these circumstances, has no very definite relation to the real temperature of the outside of the armature. The dynamo is allowed to rise in temperature to 70° Fahr. after stopping—that is to say, there may be a sort of store of heat in the armature. Before a machine is stopped after six hours' run at full load the armature and all parts of it have come to their final temperature—that is to say, the heat dissipated is exactly equal to the heat developed. For the sake of simplicity, we will assume that the armature is a drum with no internal ventilation. As a matter of fact, this is the type generally used. In that case all the heat is dissipated from the outside of the armature by radiation, conduction and convection. The last two are intimately connected and may be taken together, and account for the greater part of the heat. As the heat is all developed in the armature, and must find its way to the outside, there must be a difference of temperature between the inside and outside. If the parts where the heat is generated are covered in with insulation, which is a bad conductor of heat, the conductors will be at a much higher temperature than the surface of the armature. Only a small amount of heat is generated in the core itself, so there will be little flow of heat from the core through the insulation into the conductors and thence to the surface; the core will thus be only slightly hotter than the conductors themselves. On first starting, the core is colder and is heated partly by the armature conductors and partly by its own loss by hysteresis, but, though its capacity for heat is large, because of its large mass, it will eventually become somewhat hotter than the conductors.

As the amount of heat which will penetrate the outside insulation in a second depends on the heat conductivity of the insulation and the difference of temperature, it follows that if the insulation is a very bad conductor of heat, the difference of temperature between the conductors and the surface of the insulation of the armature will be great. The less the outside of the armature is lagged, therefore, the lower will be the temperature of the conductors for a given total loss of heat per second in the armature. As far as heating is concerned, therefore, the less lagging the better.

Let us now consider what happens on stopping after the six hours' run. The facilities for the escape of heat from the surface of the armature are enormously reduced, because there are now no draughts caused by the rotation of the armature. The generation of heat in the armature is also stopped, but the core acts as a store. If all escape of heat from the surface were prevented, the conductors would rise to the same temperature as the core—that is to say, a little higher than they were before stopping. The surface of the armature would also rise to the same temperature. If there is some dissipation of heat, however, the surface never gets so hot, and the difference in temperature between the surface and the conductor may be considerable.

If a thermometer is now applied for a minute, and covered in, say, by a bit of waste, the capacity for heat of the thermometer is, as pointed out by Mr. Willans, very considerable in comparison with the rate at which the heat can flow into it; the result is that the thermometer does not measure the temperature at all, even of the insulation on the immediate surface, much less of the conductor under it.

Suppose, now, the thermometer with the bit of waste is left for, say, half an hour, its temperature will rise nearly to the temperature of the conductors at that time. It will not rise quite so high, because the loss that still takes place through the waste is not insignificant in comparison with the supply of heat through the insulation of the conductors. Suppose the thermometer at this time shows its maximum reading of a rise of 70° Fahr. above the atmosphere, the temperature of the conductors underneath it must be still greater, by how much cannot be definitely stated. The conductors at the maximum reading are then more than 70° Fahr. above the atmosphere; but they have been cooling slowly for some 15 or 30 minutes, so that at the instant of stopping they must have been considerably more than 70° Fahr. above the atmosphere. It might be urged that at the instant of stopping they were cool, but the core was hot. This reasoning will not hold, however, for there is so little heat generated in the core itself that it cannot be much above the temperature of the conductors. It must also be remembered that during the 15 or 30 minutes the conductors have been getting rid of heat through the insulation to the surface, and there is a layer of insulation between the core and the conductors. So with the very slight difference of temperature between the core and the conductors at the instant of stopping, the conductors would get rid of heat much quicker through the outside insulation, which has a large difference of temperature on its sides, than the core could supply heat through the core insulation with a small difference of temperature.

Suppose, now, that the external insulation or lagging was taken off and the dynamo run again for six hours at full load. The same amount of heat would be generated per second, so, as the radiation, convection and conduction from the surface remain as before, the same external or surface temperature would be reached, and this would now be the temperature of the copper itself. The core would be at a slightly higher temperature. On stopping and placing the thermometer on the copper with a piece of waste over it as before, the thermometer bulb would absorb more heat than before in a minute, so that at the end of the first minute the temperature as taken by the Admiralty, would be higher than before; simply because the copper could now supply heat quickly to the thermometer bulb, as there is little or no insulation to stop the flow.

If the thermometer is left on, it might rise a little more, though the temperature of the copper will be falling gradually, as in the first case; but the thermometer can never rise to the temperature shown in the first case, because the copper and core are so much cooler to begin with. The Admiralty test thus shows a higher temperature for the cooler machine, as far as the 20° or 30° test is concerned; and if, as we understand, most importance is attached to this test, the Admiralty are doing their best to select bad dynamos. The one minute test is, as Mr. Willans pointed out at the Institution of Electrical Engineers, simply an absurd method of putting a premium on lagging dynamos in so as to supply little heat to a thermometer bulb while the temperature of the conductors is high.

The temperature of the core does not matter, what is really important is the temperature of the insulation, on which the life of the machine depends. The insulation which is important, is in contact with the copper conductors, so all that is required is to see that the temperature of the conductors is not too high. This cannot be found by leaving thermometers about on the armature, but can be determined with the greatest accuracy, by measuring the rise of resistance of the conductors. There are so many simple ways of taking the resistance, even of a short thick bar, that it is not necessary to discuss them. Another curious regulation in the specification, is that the rise of resistance of 20° or 30° Fahr., only concerns the accessible parts of the dynamo. Apparently the inaccessible parts do not matter. This is strange, because the accessible parts are the parts which are easy to repair; and there is no reason why the parts which cannot be got at, should be allowed to come to any temperatures they like. Many makers of drum armatures close the ends in such a way that the rise of temperature there is very great, and this is a frequent cause of breakdowns.

As to the highest temperature admissible, we think the Admiralty place the limit not too low, but far too high. As already explained, if the maximum rise of temperature measured in their way is 70° Fahr., it is really probably much, very much, more; but even if the conductors themselves only rise 80° Fahr., this means, in a stoke hole at 120° Fahr., that the conductors are at 200° Fahr., or nearly the temperature of boiling water! Ordinary dynamos in this country are made to have a maximum temperature of about 150° Fahr., in the United States they often allow 200° Fahr. There is no difficulty at all in making machines for Admiralty work which will have a maximum rise not exceeding, say 40° or 50° Fahr., and still smaller rises can be obtained by making the dynamos very large, and using low current densities.

The point at which insulation will char seems to be a matter of doubt. Most forms of insulations will stand 300° Fahr. for some hours without charring, but a much lower temperature will char them if applied long enough. The question is not at what temperature insulation will become carbonized enough to conduct, as to make it conduct a red heat is necessary, but at what temperature it will become brittle and mechanically weak. The cleading on a locomotive lasts for years without being thoroughly charred, but it is converted into a sort of tinder without any mechanical strength in a very short time.

Though armatures with bare copper conductors keep cooler, there is more chance of small particles of metal bridging across and starting short circuits. Apart from this, however, bare copper feels hotter to the hand, and most people try to judge temperatures by the feel. A piece of bare copper at a temperature of 120° Fahr., will burn the hand rather unpleasantly, but if it is thickly insulated, it will feel comparatively cool. It is a trick perfectly well known in the trade, when an armature gets rather warm, to lag it in so that it gets hotter than ever, for the average customer will merely feel it with his hand.

Apart from the question of the way temperatures are measured, or supposed to be measured, there is a common idea that a dynamo that gets hot must be less efficient than one that keeps cool. If the machines are the same size, and give the same output, and have the same amount of lagging on the armatures, this is, of course, perfectly true; but if the hot machine gives a larger output, or if it gives the same output and is smaller, it may be more efficient than the cool one. The temperature depends, not only on the power wasted in the armature, but also on the facilities for dissipating the heat. Other things being equal, the small armature has less facilities; so a small machine may easily by hotter than a large one and give the same output at a higher efficiency.

Before leaving the subject of heating, let it be clearly understood that we do not mean to say that the machines made for the Admiralty necessarily run hot; all we say is that the 20° or 30° clause is well calculated to make them do so.

There are very few other points in the specification which have given rise to much trouble. Nothing is said as to whether the machine is to compound accurately at the temperature of the room in which the trial takes place at Portsmouth Dockyard, or in a 120° stoke hole. If they are to be run in a hot stoke hole, resistance should be inserted in the shunt circuit during the Portsmouth test.

There are some curious regulations. A whole paragraph is devoted to details about the commutator dimensions, and another to the brushes. Surely it would be better to leave these matters to the contractors, who, if they know how to make dynamos at all, know how to make commutators and brushes. Stringent rules might, with equal propriety, be given as to the design of the terminals or the shape of the eye-bolt. These regulations only prevent makers using their ordinary patterns for commutators and brushes, and thus give annoyance. The regulation that only 96 per cent. copper should be used, might be removed with advantage. No maker would use impure copper, because it costs nearly as much per pound, and a lower current density, and, therefore, more copper would have to be used. A rule might as well have been inserted to say that a maker must not buy his raw material dear if he can get better stuff cheap. Such a regulation can only make the Admiralty appear in an absurd position in the eyes of the contractors.

Apart from these points there is nothing to be said against the Admiralty dynamo specifications. As many dynamo makers have said, they have done a great deal of good. The direct coupled engines and dynamos now coming into such extensive use for central station work, were worked out to suit Admiralty requirements, and their strictness in passing nothing but the best work has been highly beneficial to the electric lighting industry.—*London Industries.*

Defending Western Union.

COLONEL CLOWRY SPEAKS OF THE CHICAGO BOARD OF TRADE TROUBLE.

Vice-president Colonel Robert C. Clowry, who is in charge of the business of the Western Union Telegraph Company in the district which centers at Chicago, is in that city on one of his occasional business visits. A *Tribune* reporter talked with him one day, last week, on the friction which has been developed at Chicago between the Board of Trade and the company, in consequence of the ejection of the telegraph operators from the floors of the exchange. Colonel Clowry said: "Some of the dispatches that have been printed would seem to imply that the Western Union has raised its rates, and in consequence, there would be an attempt to build an independent telegraph line to New York. I do not believe that any such idea will be carried out. But it is a mistake to say that we raised our rates. We merely restored them to the figures which prevailed when our offices were allowed upon the floor of the Board of Trade. Before the war on the bucket shops was begun by the Board of Trade, we had about 60 operators on the exchange floor, and by a previous arrangement, messages between the floors of the different exchanges of the country were taken at rates from five to fifteen cents under the rate ordinarily charged. We made this concession for the reason that the business required no messengers, and was of the most economically managed nature possible. When our operators, on April 1, were ordered off the floor to the office on the ground floor, we were compelled to use many messengers to carry dispatches from the floor to the office and *vice versa*. This involved an additional expense which the difference in rates no more than covers. If we had allowed the floor rates from our ground office it would have compelled us to allow similar rates at all our ground offices in all the exchanges and the loss in revenue would have been serious. It was out of the question.

"The Western Union," continued Colonel Clowry, "has helped the Board of Trade in its war on the bucket shops, for the reason that its business interests are in that direction. Since these bucket shops have been in operation, the speculators in grain or provisions have reduced the number of telegrams that formerly in the conduct of a trade had to come to Chicago from all the interior points to an enormous extent. Several years ago we fought the bucket shops on account of their gambling character, and closed up most of them. We had 11 lawsuits on our hands at one time. But we are compelled by order of the court to furnish quotations without discrimination, and it is not our fault that we cannot help the Board of Trade in its fight. But it is not true to say that we have advanced telegraph rates. We have simply applied our regular ground floor charges to exchange business because of the additional expense when compared with business between the telegraphic offices that are on the floors of the various exchanges and that involve only a minimum of cost in maintenance and operation."

* * The submarine boat "Goubet," in its trials at Cherbourg, cut the cables of five buoys, cutting some of them while at full speed.

* * The agent, electricity, is not chargeable with the mishaps that come from careless or unskilled usage. It is not the horse that's balky, it's the driver that's stupid.

* * The building of an elevated railway in Paris, similar to those in New York, has been decided upon. Mr. Eiffel is to be the constructing engineer, and the Rothschilds will be the financial backers of the scheme.

* * Eight of the electric motor cars for use on the lines of the Albany, N. Y., railway, will be shipped from the Gilbert Car Works at Green Island in two or three days. The remainder of the 25 cars will be shipped next week.

* * For some months a line of electric launches has been in operation on the Thames, carrying passengers from London to Oxford. The launches are 12 in number, and current is furnished to the motors from accumulators which are charged at the terminal stations.

* * Pittsburgh capitalists are reported to have purchased the Cream City Passenger Railway, of Milwaukee, for $900,000. The parties purchasing are Messrs. Chalfant, Byers, Mellon and Moorhead, all iron men. It is the intention to change it at once into an electric road.

* * The progress of rapid transit is advancing with giant strides throughout the land. The latest news of its development is reported from Lansing, Mich., where the Westinghouse Electric Company has obtained the contract for equipping a complete street car line with the Westinghouse motor system.

* * There was a pathetic scene on the street car lines of Nashville a few days ago in the long line of mule cars that were being taken from the central to the suburban stables. It was raining, and the improvised teams were making their last trip. The electric motor had driven the mule away.—*Nashville American.*

* * The syndicate of New York capitalists that bought the People's Street Railway Company and the Suburban Railway Company, of Scranton, several months ago, last week purchased the stock and plant of the Scranton Passenger Railway Company. All of the street car lines in Scranton are now owned by the syndicate, and the cars on all of them are propelled by electric power.

* * Brookline, Mass., and Johnstown, N. Y., are both going in for long distance electric lighting. The electric light companies at these respective places have just concluded contracts with the Westinghouse Electric Company for special machinery for long distance lighting. The Brookline plant is to have an apparatus of 900 lights capacity, and Johnstown of 500 lights capacity.

The Essick Printing Telegraph.

This instrument is now in daily operation between Boston and New York. The machine has been very much improved and simplified in its mechanical details and is now said to be the most perfect long distance printing telegraph in existence. The line between the New York office, 169 Broadway, and the Boston office, R. D. Wilson & Co., 113 Devonshire street, is 270 miles long. Messages have been sent over a line 600 miles long without using a relay. The company hopes their instrument will be adopted by the government postal telegraph system. It seems to be able to meet all the requirements.

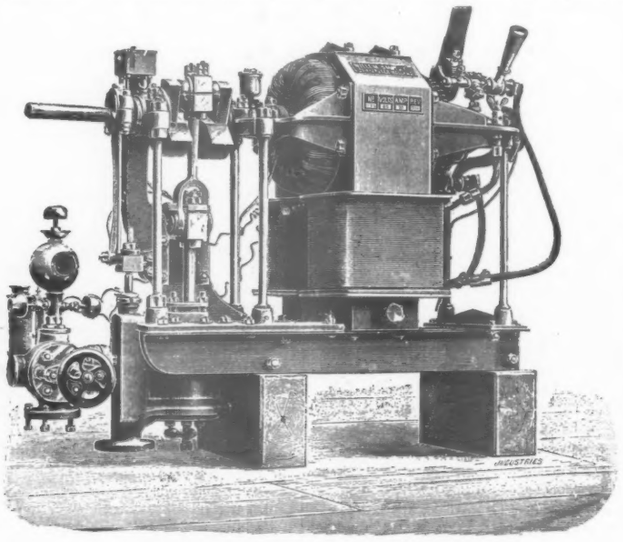
American Society of Mechanical Engineers.

The thirty-first meeting of the Society will be held at Cincinnati, Ohio, beginning May 13th and lasting until the 16th. Arrangements have been made to secure special railroad rates by which members and their wives can make the round trip for one and one-third fare. The session will be opened in the Scottish Rite Cathedral by an address of welcome by Mr. M. E. Ingalls, president of the C., C., C. & I. Railroad. A number of very interesting papers will be read, and the members attending will enjoy several excursions to the beautiful suburbs of the city and will be tendered a reception at the Art Museum.

The Smit Combined Engine and Dynamo.

We notice in London *Industries* a new form of combined engine and dynamo, made by the Messrs. Smit, of Slikkerveer, Holland, and present herewith an illustration of the same.

It is designed to run an arc light projector at sea with a view of having as little weight as possible. The output is 65 volts and 70 amperes, as required for the Dutch Navy's torpedo boat "Cerberus." In order to reduce the weight to the lowest possible limit, as demanded by the naval authorities, Messrs. Smit have used an open engine



Combined Engine and Dynamo.—Holland.

instead of the closed-in type, and thus have sacrificed efficiency, durability and freedom from breakdown. The armature is Gramme wound with 3.5 mm. wire. The speed is 450 revolutions per minute, and is controlled by an electro-magnetic governor interposed in the shunt circuit.

The engine has 4-inch cylinder, by 5-inch stroke, and works with 100 pounds to 150 pounds pressure of steam. The engine and dynamo together weigh 840 pounds, and the 20-inch projector to match weighs 520 pounds, or 1,360 pounds total weight. The outside dimensions are 3 feet, 9 inches long, 2 feet, 6 inches high, and 1 foot, 5½ inches broad.

PERSONAL.

Mr. J. A. J. Shultz, of St. Louis, paid a flying visit to New York last week, looking into the belting business of the East. Mr. W. P. Mullen, of Boston, vice-president of the company, accompanied Mr. Shultz.

Mr. Eugene F. Phillips, of Providence, paid a brief visit to his New York friends, last week, accompanied by Mrs. Phillips and his son.

Hon. C. S. Gleed, president of the Topeka City Railway Company, is in Boston to arrange for an electrical equipment for his street car lines.

Mr. Frederick L. Rawson, of the well-known house of Woodhouse & Rawson, London, has been visiting the United States for a few weeks.

THE HUMOROUS SIDE OF IT.

The Boston *Herald* has an isolated electric light plant in their handsome building on Washington street. The dynamos are down stairs near the press room. One night last summer a Review representative sauntered in to look 'round, and in the course of this pleasant occupation struck up a conversation with the dynamo tender, during which the following story was related.

"Well, sir," said the dynamo tender, "one night, not long ago, I had just oiled up, and was sitting down reading my paper, when an old fellow trickled into the dynamo room here, and for the life of you, you couldn't have told him from these comic pictures of Uncle Sam. I guess he was from Maine. He didn't seem to notice me, so I thought I wouldn't say anything, but just see what he'd do. Well, sir, the old fellow took everything in; looked at those armatures running 1,200 to the minute; followed the feeders up from the brushes to the wall, ran his eye along the ceiling and down the wires to the lamps. He didn't hurry a bit, but saw it all thoroughly. At last he shuffled over to where I sat, put his hands behind his back, expectorated a flood of tobacco juice into the saw dust box, and then paralyzed me with this: 'Wall, son, ef them ain't the littlest pipes to pump oil through, I'll be gosh-darned.' It took me a good hour to convince the old hayseed that the dynamo wasn't a pump, and that the wires weren't pipes to carry 'oil' to the lamps."

The writer was delayed once at Springfield, Mass., at the time the Boston and Albany Railroad were installing their electric plant for lighting the depot. A workman was screwing an incandescent lamp into a socket, and one of the waitresses in the dining room was watching him intently. Presently the following conversation took place:

"How d'ye light them things?" said the girl.

"Why," replied the workman, "you go over to the wall there, turn that switch, and then come back to the lamp and turn this key."

"I know, but how d'ye light it?"

"When you turn the key on the lamp, it will burn."

"But where d'ye put in the match?"

The look of disgust on the workman's face may be imagined.

It is said that one of the Bell Telephone officials, now high in authority, when he first became connected with the company, actually thought a telephone wire was hollow, and that the sound was carried through the hole.

At the Lenox Lyceum Electrical Exhibition it is extremely amusing to watch the varying expressions which play over the faces of visitors, as they stand with a telephone receiver at each ear and listen to what is being said at the other end of the line. One day, recently, a little fellow about ten years old, arrayed in a full suit of sailor's togs, was brought into the telephone room by his nurse. An attendant gave him a pair of receivers, which he placed at his ears, and the expression on his face for some minutes was one of intense interest. Suddenly his face colored up, his eyes snapped, and placing one of the receivers to his mouth, he called out in a shrill voice, "'Tain't so, you d——d rascal!" It was as much a puzzle to the attendants to discover what he had heard as to hear the oath slip from his youthful lips. No chance for explanation or inquiry was given him, for his nurse hustled him behind a screen and gave him a good, sound spanking, as his yells attested.

A plainly dressed woman walked into one of the public booths and said she wanted to talk to her husband. When asked his address she replied, "Well, he's up in Maine somewhere; he's a woodchopper." The attendant explained that this address was rather vague and he didn't believe they had wires running to all the Maine logging camps. Whereupon the woman remarked, "This show's a cheat; I thought ye didn't need no wires to talk through nowadays?"

Another time, at the Lyceum Exhibition, a young man and his sweetheart had stopped in front of Edison's motograph. The man was one of these chaps who knows it all and he was very prolific in his explanations. In fact, there wasn't anything he couldn't explain. His companion asked what "motograph" meant? "Why," says he, "don't you know? 'Moto' means motion, and 'graph' means illustration; 'illustration of motion.' See?"

Trade mark for electrical execution machine: "We press the button; you do the rest."—*Life.*

Yes, Sylvester, under certain circumstances we think you would be justified in calling a rheostat a *pièce de resistance.*

"What tools shall I use?" said the subway laborer to his foreman.

"Oh, take your pick," was the easy reply.

"Keep your eye on those brushes; they seem to be in love," said the superintendent to the dynamo tender.

"In love?"

"Yes; don't you see them sparking?"

The Lenox Lyceum Exhibition.

On Friday evening, April 24th, the members of the American Institute of Electrical Engineers and the New York Electrical Society were invited to attend the exhibition. Mr. A. B. de Frece, the managing director, had provided several novelties for the evening entertainment, among others, being an especially interesting musical programme. Another feature was an exhibition of the chalk or loud-speaking telephone. This instrument has not been brought forward very prominently for the last few years, and a short description may not be amiss.

A small box, which takes the place of the ear-piece on the ordinary telephone, contains in its front a diaphragm of mica about five inches in diameter. In the center of this vertical diaphragm is fastened a brass tongue about two inches long, which extends horizontally back into the box. The tongue rests upon a spool of chalk about half an inch wide and an inch in diameter. The chalk is moistened slightly with water. On top of the tongue is a piece of hard rubber which presses the tongue down upon the chalk spool. A tension screw is attached to the rubber, so that the pressure on the tongue may be easily regulated. When the telephone is in operation, the chalk spool is revolved slowly, either by means of a crank which is worked by hand or by a little electric motor. The pulsations of sound transmitted along the line, when they reach this microphone, are greatly increased in loudness by the vibration of the brass tongue upon the chalk wheel.

The chalk phone exhibited on this occasion was connected with the phonograph room, and with an ordinary telephone transmitter in another part of the house.

Every word and note sent into the transmitter was distinctly audible 20 feet away from the microphone, and if the room had been quiet, could no doubt have been heard still further away.

The fundamental principle of the chalk telephone was shown in an experimental form by one of Mr. Edison's representatives at Paris, in 1881. Helmholtz, the great scientist, when he saw it, exclaimed, "It is diabolical."

The Thomson Electric Welding Process.

The illustrations presented herewith show several forms of the Thomson Electric Welding Company's apparatus. The process is so well known as to need little explanation. It consists in general of a device for holding the pieces to be welded, a current generator and methods of controlling the holding device and the current. The two pieces to be welded are set in the clamps and butted against each other with a force which can be easily regulated. Current of large quantity and low pressure is passed through the abutting ends of the pieces. Heat is generated at the point of contact, which is the point of greatest resistance, and at the same time pressure is applied to force the parts together. If desired, the weld may be wrought upon an anvil, as in the case of axles and tires. Dissimilar, as well as similar, metals may be joined with ease, and experiment has proved that the joint is the strongest part of the piece.

We give below a summary of the work on which the 79 machines, already built by the Thomson Electric Welding Company, of Lynn, Mass., are, or are intended to be, engaged:

Iron and steel wire, 9; hard steel (gun) wire, 2; copper and brass wire, 8; copper rods, etc., to one inch diameter, 4; pipe from two to six inches diameter, 4; axles, tires and wagon work, 35; miscellaneous hardware, 7; brazing and welding, 3; upsetting collars on axles, 2; steel wire cable welding, 2; lead strips, 1; street rail splicing, 1; upsetting bridge eye-bars (six inch by one inch), 1.—Total, 79.

One of the most striking features of the process is the precision with which the heat is localized at the spot required. For example: When two bars of inch iron or steel are welded, they become red-hot for a length of about one and a half inches on either side of the weld, but at distances an inch further from the weld are quite cool when they come from the machine; hence, there is no unnecessary waste of heat. The time required to weld round iron bars of one and one-eighth inch diameter is, on an average, less than 33 seconds; round bars of steel of three-quarter inch diameter require about 16 seconds, and in welding this diameter of steel, the average power required is about 11.40 kilo-watts.

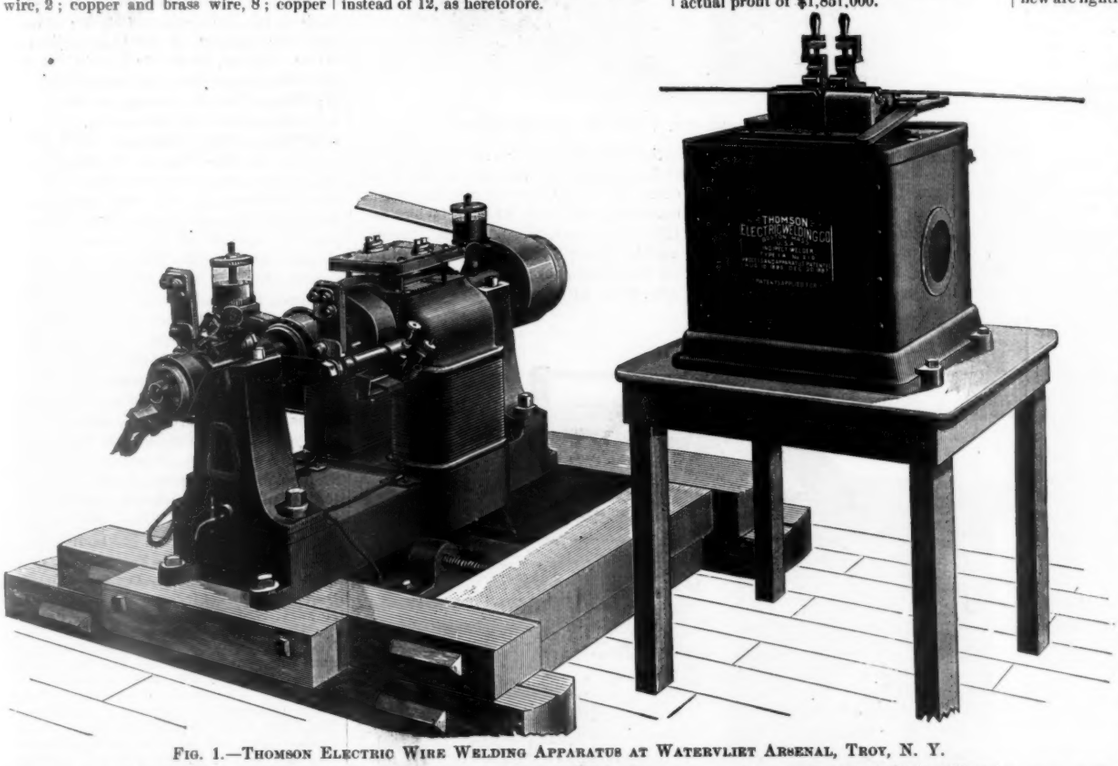


FIG. 1.—THOMSON ELECTRIC WIRE WELDING APPARATUS AT WATERVLIET ARSENAL, TROY, N. Y.

—— The Ouray Electric Light Company, of Ouray, Col., one of the oldest alternating current central station plants of electric lighting in the country, a few days ago contracted for an increase in its capacity. The Westinghouse Electric Company is now occupied with putting up one of its 750-light machines, making the total capacity of the plant 1,500 lights.

The Cartwright Protector.

The Electrical Safety Company, 146 Franklin street, Boston, are the sole owners of patents issued to David J. Cartwright, in 1885, for "protectors for electrical instruments."

At the recent test made by the Boston Fire Underwriters' Union, the Cartwright protector fulfilled perfectly all the requirements, and was considered well adapted for use on fire alarms and metallic circuits. As a result of the test, the Cartwright protector was approved and accepted by the Board.

—— The Westinghouse arc lighting system has been adopted by the Evanston Electric Illuminating Company, of Evanston, Ill., which has for some time been employing the incandescent apparatus manufactured by the Westinghouse Company. The arc light plant will have an initial capacity of 120 lights.

—— A contract was closed a few days ago between the trustees of the village of Potsdam, N. Y., and the electric light company, for the lighting of the streets during the coming year. The contract provides for 38 arc lights at $60 each, the same price as last year, the lights to be run until 1 o'clock instead of 12, as heretofore.

—— For some months a 750-light alternate current incandescent machine of the Westinghouse manufacture has been in use at Sherman, Texas. The company operating the machine is evidently well pleased with its workings, for it has just placed with the Westinghouse Electric Company an order for an additional machine of 750 lights capacity.

—— The electric light company in Flushing, L. I., has begun operations under most favorable auspices. The company began to supply its customers the early part of last week, and the service could hardly be improved upon. The incandescent lights in stores worked to perfection, and the arc lights that are on Broadway, leading to Bayside, prove most satisfactory. The arc lights light up the broad street brilliantly, and high encomiums can be heard on all sides. The introduction of electric lights is one of the most important improvements ever introduced in Flushing, and the gentlemen who comprise the electric light company are receiving the credit due them. A number of business men in the town have contracted for lights in their stores, and everything goes to show that the company's venture will prove a success.

—— The Citizens' Electric Light Company, of East St. Louis, Mo., is stringing wires preparatory to lighting buildings with incandescent lamps. The lamps will be ready for use by the first of May.

—— C. L. Willoughby, of Chicago, has made a large purchase of Plymouth, Mass., beach property, comprising about two miles in length. It is said he will run an electric railway along the beach and develop property hitherto unproductive.

—— The Massachusetts Committee on Manufactures made a report relative to their investigations at Alexandria, Richmond and Philadelphia, as to the manufacture and sale of gas and electric lights by municipalities. The committee does not consider it advisable to recommend the adoption of municipal control of gas or electric light works in Massachusetts cities and towns. In Richmond, they say, it is evident that a limited number of citizens are paying a high price for gas without corresponding advantages to the city. In regard to Philadelphia, it says if the offer of $1,200,000 rental and 17,000 street lights free were accepted, the city certainly would get its gas as cheaply as it does now, and instead of an actual loss of $104,145, would have an actual profit of $1,851,000.

—— At a meeting of the United Electric Light and Power Company, held in New York, last week, it was decided to increase the capital stock from $3,000,000 to $5,000,000. The new stock will be preferred, and will be entitled to a preference up to and not exceeding six per cent. out of the first earnings of the company before any dividends are paid on the common stock. The increase is for the purpose of improvements and enlargement of business.

—— The great value of the electric light in street illumination was illustrated by a fatal accident in Paris the other day.

"It seems," says a London contemporary, "that a workman, dressed in a neat white blouse and having the appearance of a stonemason, fell in the Rue de Rambouillet, possibly from effects of drink or possibly in a fit. The exact circumstances are not known, for the street being at that point quite in darkness, the driver of a wine dray passed along, and not being able to see the unfortunate man, the dray passed over his body, completely crushing his chest and head. The affair may probably cause another lamp to be erected at the spot, but there are many points where more light would obviate both accidents and crime."

ELECTRIC LIGHT NEWS

—— The Edison Electric Illuminating Company, of Rochester, N.Y., has increased its capital stock from $225,000 to $325,000, and re-elected its old board of directors.

—— Arrangements are being made for an extensive electric light plant at Audubon, N. J., just out of Camden, and the town will soon be lighted throughout by electricity.

—— The Brockton, Mass., Edison Electric Illuminating Company is preparing to make changes and alterations in its machinery that will cost $18,000. Its mains will also be extended.

—— Thomas Trebell, J. J. Scoville, A. Humphrey, W. B. Reynolds and J. H. Smith, have incorporated the Oakland, Cal., Electric Construction Company. The capital stock is limited at $1,000,000.

—— Martin's Ferry, Ohio, is to use the new arc lighting system manufactured by the Westinghouse Electric Company. An order has just been placed with the Westinghouse Company for a 40-light machine.

—— The Westinghouse Electric Company has an order from Joliet, Ill., for one of its new arc machines of 60 lights capacity. The order comes from the Joliet Electric Light Company, which is running an incandescent plant of the Westinghouse system.

—— *La Nature* gives an account of an alarm girdle for men-of-war or harbors, to protect them from the sudden attack of torpedo boats by night. The girdle is made of wire with floats, and is supported by buoys at intervals all round the vessel. When the enemy breaks through the line at night a light flares up and indicates the spot.

—— The Uxbridge & Northbridge Electric Company, of Northbridge, Mass., which is using the Westinghouse incandescent system, has decided to embark in arc lighting and with that end in view has placed an order with the Westinghouse Electric Company for an arc light machine of 60 lights capacity, to be shipped as soon as possible.

—— The United Electric Light and Power Company, of Springfield, Mass., a few days ago ordered from the Westinghouse Electric Company an increase of 3,000 incandescent lights capacity to its present plant. The United Company has in use Westinghouse dynamos of a capacity of more than 5,000 lights, and with the addition of the late order will have a plant of very considerable size.

—— A bar of steel about a foot long was allowed, accidentally, to come in contact with the two poles of a dynamo in action. The operator instantly felt a painful sensation of burning, and he let the bar drop. He found his fingers, where they had been in contact with the bar, severely blistered. The bar was found, immediately afterward, to be quite cold. This proved the outer surface of the steel to have been intensely heated, and that not enough of heat was generated sensibly to warm the whole bar; in other words, that an exceedingly high temperature existed for an exceedingly short time in an exceedingly thin skin of metal.

KINDRED INTERESTS

The Card Electric Motor and Dynamo Company, of Cincinnati, have issued a catalogue and price list of their machines, which have a neat appearance, and seem to possess good workmanship and efficiency.

The Walker Electric Meter Company have secured the services of Mr. Geo. B. Prescott, Jr., manager of the Kerite Company, as consulting engineer. This firm reports business prospects good and looks forward to a general adoption of the meter.

The Burton Electric Company, of Richmond, Va., are receiving many inquiries from all quarters of the globe, in regard to their electric heaters. They will manufacture extensively during the summer, so as to be ready for next winter's rush of business.

The Metropolitan Rubber Company, 649 Broadway, began making double thickness rubber gloves for the use of linemen, about six months ago. The Brush Electric Company, of Buffalo, were the first purchasers of these goods, and recently quite a number of other companies have supplied their men with these useful articles.

The Westinghouse Electric Company has just closed an order for a 750-light incandescent outfit to go to St. Thomas, Ont. The St. Thomas Gas Company is the buyer. The plant is to be installed at once. Orders are coming in rapidly for the new arc lighting apparatus of the Westinghouse Electric Company and pleasing reports are received from those who have put in the apparatus.

The Edison Lamp Company, of Harrison, N. J., have sent out catalogue "E" and price list of Edison experimental lamps. The pamphlet also gives full and explicit directions how to make a cheap battery. On the inside cover pages are enumerated the dates and number of 121 patents granted to Mr. Edison for his incandescent lamps. The date of the first is August 29, 1876, and that of the last is March 20, 1888.

The "C. & C." Electric Motor Company, of New York, report the following sales, made recently, which speaks well for this enterprising company: Edison Illuminating Co., Brooklyn, one 3 h. p., for ventilating station, and one ½ h. p. fan outfit; one 1 h. p. to Pennsylvania Railroad shops, Altoona, Pa.; one 10 h. p. to American Press Association, Chicago, Ill.; one 1 h. p. to Messrs. Gahl & Lembke, 21 Union Square, New York; one 2 h. p. to T. H. Porter, Stamford, to run elevator; one 2 h. p. to Edison Electric Illuminating Co., Newport, R. I.; one 10 h. p. to *Sunday Telegram*, Harrisburg, Pa.; one 1 h. p. to First Presbyterian Church, Easton, Pa.; one 1 h. p. to J. H. Simpson, 154 West Twenty-third street, N. Y., to run ventilating fan; one 3 h. p. to Edison Electric Illuminating Co., 432 Fifth avenue, N. Y.; one 8 horse-power to the Solomon Lord Building, Eighteenth street and Broadway, running elevator; one 1 horse-power to Thompson's, 25 East Fourteenth street, New York, running ventilating fan; one 1 horse-power to Warren & Witherell, 201 Hanover street, Boston, Mass., to run coffee grinding machine; one 2 horse-power to St. Thomas' Church, Fifty-third street and Broadway, New York, to run ventilating fan; one 1 horse-power to Edison Electric Illuminating Company, Fall River, Mass.; one 1 horse-power to C. M. Gage, Champion Card and Paper Company, Pepperell, Mass.; one 5 horse-power to Fletcher & Co., Portland, Me., to run elevator; one 5 horse-power to Dr. Kilbourne, President of Seattle Electric Railway and Power Company, Seattle, Washington; one 2 horse-power to Ryan Bros., Appleton, Wis.; one 1 horse-power to *Court Journal* Publishing Company, 608 F street, Washington, D. C., to run press; one 2 horse-power motor to B. F. Robinson, 21 Broadway, Lawrence, Mass., to run lathe; one 5 horse-power to Fell & Josephs, Wilmington, Del., to run elevator; one 4 h. p. to Bradley Fertilizer Co., North Weymouth, Mass.; one 4 h. p. to Allen & Kenway, 220 Devonshire street, Boston, Mass., to run ventilating blower; one 2 h. p. to Howard & Co., 264 Fifth avenue, New York, to run jewellers' lathe and polishers; one 1 h. p. to Trinity Church, Easton, Pa.; one 3 h. p. to Whiting Manufacturing Co., Union Square, New York, to run jewellers' lathe and polishers; one 4 h. p. to Prof. C. A. Young, Halstead Observatory, Princeton, N. J., to turn observatory dome; one 5 h. p. to Fraser & Chalmers, Salt Lake City, Utah, to run a dynamo; one 3 h. p. to Leighton & Wilson, Phœnix Building, Salem, Mass.; one 2 h. p. to Kobe, Japan; one 5 h. p. to G. B. Grant, 137 Franklin street, Boston, Mass.; one 15 h. p. to Snyder & Black, 92 William street, New York, to run lithographic and printing presses; one 1 h. p. to Wickstead Umbrella Co., 47 John street, New York, running machine shop; one 1 h. p. to Church of Holy Communion, Sixth avenue and Twentieth street, New York; one 3 h. p. and one 10 h. p. to W. R. Danderson, 194 Water street, New York, running printing presses; one 10 h. p. to Trask Milling Machine Co., 118 South street, Boston, Mass., running machine shop; one 1 h. p. to Southern District Telegraph and Electric Co., Birmingham, Ala., to run printing presses; one 1 h. p. to Roanoke Light and Power Co., Roanoke, Va., used in printing the Roanoke *Daily Herald;* one 1 h. p. to General Society of Mechanics and Tradesmen, 18 East Sixteenth street, New York, to run ventilating fan; one 1 h. p. to St. John's Church, Reading, Pa.; one 15 h. p. to William Silverman, the Wire Buckle Suspender Co., Williamsport, Pa., to run shop; one 5 h. p. to John J. Tuomey, Jackson, Mich.; one 15 h. p. to W. W. Bullock, Wilmington, Del.; one 3 h. p. to D. P. Gosline, 83 Oliver street, Boston, Mass., ventilating fan; one 15 h. p. motor to Queen City Electric Light Co., Gadsden, Ala.; one 1 h. p. to Silvey Electric Co., Lima, Ohio; one 2 h. p. motor to Meyer, Singer & Co., Lycoming Pants Factory, Williamsport, Pa., to run sewing machines; one 4 h. p. to D. Coughlin, 5 Mill street, Lawrence, Mass., to run 28 inch saw; one 1 h. p. motor to Trinity Episcopal Church, West Fourth street, Williamsport, Pa., to run organ bellows; one 7 h. p. motor to Mercantile Printing Co., Wilmington, Del., to run presses; one 20 h. p. motor to Perry Woodworth, Smith building, Cincinnati, Ohio.

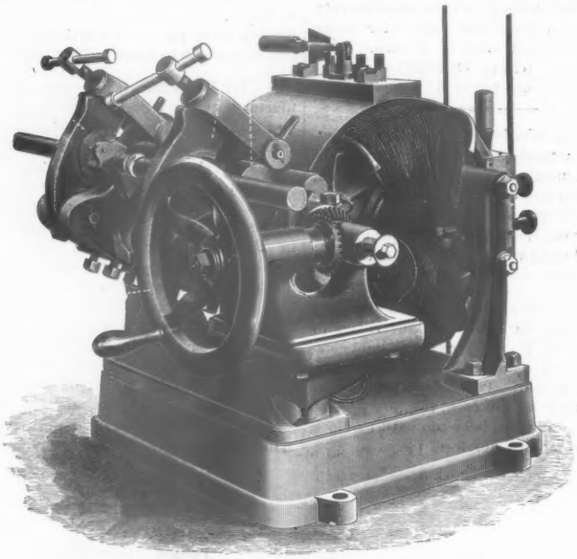


FIG. 3.—WELDING MACHINE FOR ONE-INCH IRON OR STEEL.

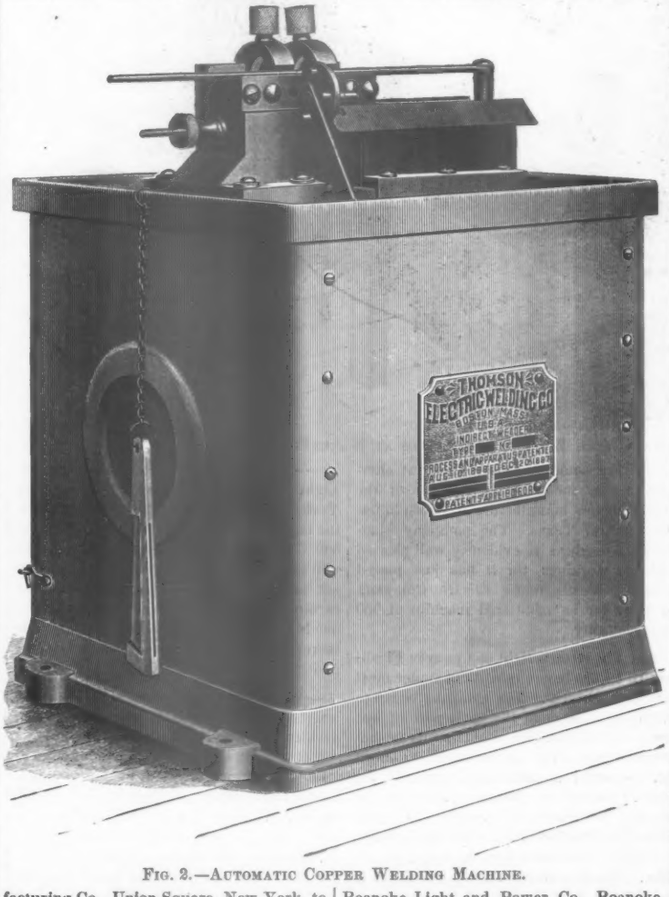


FIG. 2.—AUTOMATIC COPPER WELDING MACHINE.

The Thomson-Houston Electric Company reports the following sales: CENTRAL STATION.—*Arc.*—Paris, Ky., 20; Maysville, Ky., 30; Miamisburg, O., 70; Lebanon, Ky., 30; Winchendon, Mass., 30; Sleepy Eye, Minn., 30; Nantucket, Mass., 30; New Philadelphia, O., 35; Mt. Sterling, Ky., 50; Narragansett Pier, R. I., 50; Greenwich, Conn., 50; Providence, R. I., 250; Seattle, Wash., 100; Great Falls, Mont., 100; Lawrenceville, Ind., 50; Yakema, Wash., 50; Atlanta, Ga., 100; Memphis, Tenn., 100; Reading, Pa., 50; Manitou, Col., 30; Alma, Mich., 30; Freeport, Ill., 50; Legonier, Ind., 20; Mt. Clemens, Mich., 30; Laredo, Texas, 100; Milwaukee, Wis., 35; Oakland, Cal., 35; Chicago, Ill., 38; Sacramento, Cal., 50; Terre Haute, Ind., 50. *Alternating.*—Dyersburg, Tenn., 300; Cincinnati, O., 1,300; Pomeroy, O., 650; Winchendon, Mass., 650; Mt. Sterling, Ky., 650; Fall River, Mass., 650; Charleston, S. C., 650; Nantucket, Mass., 650; Greenwich, Conn., 650; Miamisburg, O., 650; Great Falls, Mont., 1,950; Marysville, Cal., 650; Denver, Col., 650; Laredo, Texas, 1,300; Alma, Mich., 650. ISOLATED PLANTS.—*Incandescent.*—Salmon Falls Manufacturing Company, Salmon Falls, N. H., 100; Palmer Bros., Pittsville, Conn., 100; Bradford, Lewis & Sons, Walpole, Mass., 100; T. J. Stewart & Co., Oldtown, Me., 200; India Wharf Brewing Company, Brooklyn, N. Y., 400; C. F. Hovey & Co., Boston, Mass., 200; Pittsburgh Plate Glass Company, Tarentum, Pa., 800; Saxon Worsted Company, Franklin, Mass., 400; Sears Building, Boston, Mass., 400; Bijou Theatre, Boston, Mass., 400; Standard Stamping Company, St. Louis, Mo., 250; Claus, Sheer & Co., Fremont, O., 100; Beckell House, Dayton, O., 800; H. H. Hart, New York City, 600; Curtis & Bro., Newark, N. J., 50; Pierce, Butler & Pierce, Syracuse, N. Y., 100; Bendit, Dray & Co., New York City, 100; Lukens Iron and Steel Company, Coatesville, Pa., 100; John Kranz, Chicago, Ill., 300; Illinois Steel Company, Milwaukee, Wis., 50; W. G. Clark, Chicago, Ill., 300; G. F. Culmer & Bro., Salt Lake City, Utah, 150. *Arc*—Lukens Iron and Steel Company, Coatesville, Pa., 20; C. F. Hovey & Co., Boston, Mass., 30; Lookout Mountain Hotel, Chattanooga, Tenn., 30; Castlegate Mine, Utah, 30; J. Featherstone & Co., Chicago, Ill., 20; Osceola Gravel and Mining Company, Osceola, Nev., 3; University of Notre Dame, South Bend, Ind., 12.

What's the Matter with "Ride"?

A name for the process of traveling by an electric motor was asked by the chairman of the new Electric Traction Company in London, and such terms as these were suggested through *Times*: To voltate, to volve, to electripede, to electro, to lectro, to dyno, to Morse, to teleway, to fare, to fluid, to galve, to electricit, to vect, to current, to blitz, to flit, to burr, to buzz, to electroforce, to trize, to locre. The *Scots Observer* added this:

THE PASSIONATE ELECTRICIAN.

Sweet, shall we volt it? Dearest, shall we ohm
Our winged way across the ocean foam?
Or were it fairer to electrioize
(Or electrate) our path to happier skies?
What's in a name when all roads lead to Rome?
Fairest and rarest under heaven's high dome,
Oh, shall we squirm, or Watt, or electrome?
Or, if you feel you'd rather not volize,
Sweet, shall we volt?

Heart of my heart, no fond and frolic tome
But the grave *Times*, that moral metronome,
Bids us coulomb, or spark or motorize.
And now I think of it, the blue day dies;
'Tis time, 'tis time, that we were moting home—
Sweet, shall we volt?

ELECTRIC CLUBS.

ANNUAL MEETING OF THE CHICAGO CLUB.—PRESIDENT BEACH RE-ELECTED.—GENERAL CLUB NEWS.

Chicago Electric Club.

The Regular Meeting of the Electric Club, which should occur on Monday evening next, has been postponed one week, making the next meeting Monday, May 5th.

The Attendance at the Club during lunch hour, is on the increase of late.

The Following Gentlemen were recent visitors, and were registered at the Club: A. H. Gould, Sioux City, Iowa; Geo. M. Ellis, Chicago; Thos. J. Craghead, Chicago; H. P. Upham, Chicago; Fred. Lincoln, Chicago; E. Ratheman, Berlin, Germany; Gus. P. Wilson, Philadelphia, Pa.; A. E. Graham, Pueblo, Col.; Edwin Tucker, San Francisco, Cal.; H. P. Lucas, St. Paul.

The Annual Election was quite well attended, 112 votes being cast. Messrs. F. S. Terry and F. E Degenhardt were appointed tellers. The election resulted as follows: President, F. G. Beach; vice-presidents, F. B. Badt, Alex. Kempt, D. P. Perry and W. H. McKinlock; secretary, W. A. Kreidler; treasurer, F. S. Terry; board of managers, B. E. Sunny, M. A. Knapp, F. W. Cushing, George O. Fairbanks, William Taylor. F. E. Degenhardt, E. Baggot, F. W. Parker, George C. Bailey, C. H. Wilmerding; membership committee, C. C. Haskins, George Cutter, W. B. Pearson.

An Address was delivered by President Beach on the occasion of the annual meeting. He stated that the Club had a membership of 230 at the present time, an increase during the past year of 95 members.

The Treasurer's report showed the receipts for the year to be $10,707.48; the expenditures, $10,553.78, leaving a balance of $153.70. The assets of the Club were reported to be $2,750, not counting expenditure of $1,200 on the rooms. The Club's finances have been well handled. and the organization is now in good financial shape.

Boston Electric Club.

The Ladies' Reception on Wednesday evening was a most satisfactory and successful affair, as will be noted from the detailed account of the enjoyable event in another column.

Mr. Otis K. Stuart has fully recuperated his health and strength, and is enabled once more to resume his regular business.

General W. A. Stiles, of "Quincy" fame, has returned from a foraging expedition in the wilds of northern Massachusetts. Unlike his brother hunter, "Professor" A. B. Griggs, he did not bring home his game, either alive or stuffed.

Mr. Chalmers, representing one of "Gotham's" most important electrical enterprises, has been spending a few days at the "Hub," and was a welcome visitor at the Club rooms.

Mr. Alex. P. Wright, secretary of the House and Entertainment Committee, has been the recipient of justly merited praise from his fellow members for his untiring labors in decorating the Club rooms and supervising all the arrangements preparatory to the successful reception and entertainment last Wednesday evening.

The Regular Monthly Meeting of the Club will take place on Monday evening, May 5th. Important business matters relating to the progress and prosperity of the Club, will be brought up for discussion. Nine applications for active membership will be acted upon.

New York Electric Club.

A Thorough Spring house cleaning has put the Club house in fine trim. The front doors are resplendent in a new coat of paint, and everything has a new, fresh air, which reflects credit on the house committee and the steward.

Recent out of town visitors at the Club were: E. Douglas Archibald, London; T. Cooper, Toronto, Can.; A. B. Uline and Jas. J. Fitzsimmons, Albany; Geo. F. Calkin and M. F. Bruce, St. John, N. B.; C. E. Lawrence, W. C. McIntire, F. B. M. Cardeza and Chas. J. de V. Keefe, Philadelphia; C. W. Grant, Jamestown, N. Y.; J. F. Morrison, Baltimore; R. T. MacDonald, Fort Wayne, Ind.

Office of Light House Engineer, 3d Dist.,
At Tompkinsville, New York,
April 5, 1890.

PROPOSALS will be received at this office until 12 o'clock M., on Saturday, the 26th day of April, 1890, for furnishing and delivery of a dynamo generator for the Statue of Liberty, New York harbor. Forms of proposal, specifications, and other information showing what is required, can be had by applying to this office. The right is reserved to reject any or all bids, and to waive any defects.

D. P. HEAP,
Major of Engineers, U. S. A.,
Light House Engineer.

PROPOSALS FOR SUPPLIES.

OFFICE OF LIGHT HOUSE ENGINEER,
THIRD DISTRICT,
TOMPKINSVILLE, N. Y., April 21, 1890.

SEALED PROPOSALS will be received at this office until 12 o'clock M. on Saturday, the 10th day of May, 1890, for furnishing Miscellaneous Articles for the Light House Establishment.

The articles needed consist of 21 numbered lots, embracing, respectively, Charcoal, Coke and Cumberland Coal; Building Material; Engineers' Supplies; Hardware, Tools, etc.; Iron and Steel; Belting; Graphite Paints, etc.; Lumber; Boiler Covering; Plate Glass; Galvanized and Russia Sheet Iron, Tin, Solder, Sheet Zinc and Iron Wire; Sheet Brass, Composition, Brass and Nickel Castings; Bells; Acids; Iron Castings; Sheet Iron Smoke Stacks for Boilers; Electrical Supplies; Electoplating Supplies; Shooks for Oil Supply Boxes; and Miscellaneous Articles; all of which are enumerated in the specifications attached to the form of bid, which may be obtained on application to this office.

Samples may be seen or information obtained at this office concerning any article not sufficiently described in the specifications.

Bids will be received for one or more numbered lots complete.

The right is reserved to reject any or all bids, to strike out any item or items in the specifications, and to waive any defects.

D. P. HEAP,
Major of Engineers, U. S. A.,
Engineer Third Light House District.

SUNNY OFFICES
IN THE
"NEW ENGLAND"
AND
"HATHAWAY" BUILDINGS
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As a rule, business men spend most of their DAYS in offices which should be SUNNY and PLEASANT to be HEALTHY.
Our rooms face South and are
COOL in SUMMER & WARM in WINTER.
ARTHUR H. TABER, Agt.,
Room 28. 620 ATLANTIC AVE.

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ALUMINIUM—Its History, Occurrence, Properties, Metallurgy and Applications, including its Alloys. By Joseph W. Richards, M. A., A. C., Instructor in Metallurgy at the Lehigh University. Second edition, revised and greatly enlarged. Illustrated by 28 engravings and two diagrams. 510 pages. 8vo.

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☞ *A circular of four pages, 4to, showing the full Table of Contents of this thoroughly revised and recast treatise, showing the state of the industry up to 1890, and which has played an important part in the rapid development of this New Metal, will be sent free, and free of postage, to any one in any part of the world who will furnish his address.*

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WARNING TO INVESTORS.
Suit against the UNITED STATES ALUMINUM METAL CO., OF NEW YORK, operating the so-called Herault Process of Electric Smelting, has been begun by the COWLES ELECTRIC SMELTING AND ALUMINUM CO., OF CLEVELAND. The alleged process of Herault is a gross infringement of the Cowles patents, and investors are hereby warned that we shall maintain these claims to the full extent of the law.
EUGENE H. COWLES, President.

WANTED.—A young man, graduate of Cooper Union, and experienced mechanic, desires a position as assistant to an Electrical Engineer; can also assist at draughting.
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THE OWNERS of a large, modern manufacturing establishment in central New York, have business which occupies the plant for a part of the year only. They would be glad to undertake the manufacture of
Electrical Apparatus, Dynamos, MOTORS
Or any Appliances used in Electric Lighting or for Traction Purposes, for parties who may not have sufficient facilities for present orders. Capacity of the foundry, thirty tons of casting per day, which can be increased if desired. Machine shop well equipped with modern machinery and capacity for employing 150 to 200 men.
This factory is exceptionally well located for receiving supplies and for getting low rates of freight both east and west.
Correspondence addressed to "ELECTRIC," care of Editor ELECTRICAL REVIEW, will receive prompt attention.

ELECTRICAL PATENTS

INDEX OF INVENTIONS FOR WHICH LETTERS PATENTS OF THE UNITED STATES WERE ISSUED ON APRIL 22, 1890.

425,990 Electric machine for covering wire, etc. 425,991 Electric motor; Frank E. Davis, Boston, and John Scott, Jr., Plymouth, Mass.

425,995 Electric fan; Philip Diehl, Elizabeth, N. J.

425,999 Process of manufacturing electrodes for secondary batteries; Ludwig Epstein, Berlin, Germany.

426,024 Magnetic circuit closer; John von der Kammer, New York, N. Y., assignor of one-half to James Ward Packard, same place.

426,049 Electric switch; James P. Norton, Detroit, Mich.

426,055 Incandescent electric lamps; James W. Packard, New York, N. Y., assignor to the Westinghouse Electric Company, of Pennsylvania.

426,064 Insulating hanger for overhead supply conductors. 426,065 Current indicator. 426,066 Trolley support; Frank B. Rae, Detroit, Mich.

426,067 Apparatus for coiling metal rods; Henry Roberts, Pittsburgh, Pa.

426,082 Safety connection; Elihu Thomson, Lynn, Mass.

426,102 Electric railway contact; Francis O. Blackwell, New York, N. Y., assignor to the Thomson-Houston Electric Company, of Connecticut.

426,108 Safety device for dynamos; Ernest P. Clark, New York, N. Y.

426,121 Insulated joint; Emil F. Gumert, New York, N. Y.

426,127 System of electrical distribution; Chas. J. Kintner, New York, N. Y.

426,144 Electric signaling apparatus for hotels; John J. Miller, Cleveland, Ohio, assignor to James P. Langley, East Saginaw, Mich.

426,153 Converter; Edmund Wagemann, Little Rock, Ark., assignor of six-sevenths, to John D. Adams, Dean Adams, Oscar Davis, John W. Davis, Horace G. Allis and John B. Jones, all of same place.

426,155 Electric lamp hood and support; Ernest P. Warner, Chicago, Ill., assignor to the Western Electric Company, of Illinois.

426,189 Holder for incandescent electric lamps; Philip H. Kleine, Jr., New York, N. Y., assignor to the Bergmann Electric and Gas Fixture Company, same place.

426,196 Apparatus for hauling through electric cables. 426,197 Underground corduit. 426,198 Insulator. 426,199 Duct for electric conductors. 426,200 Flexible connector. 426,201 Insulating lining. 426,202 Insulating compound. 426,203 Insulator. 426,204 Binding-post. 426,205 Duct for electric conductors. 426,206 Manhole for underground electric conduits; James F. Munsie, Brooklyn, assignor to Thos. L. Coles, New York, N. Y.

Notice for Proposals for Lighting the Streets in Holyoke, Mass., by Electricity.

The Committee on Fuel and Street Lights, of the City of Holyoke, Mass., invite proposals for lighting the streets of said city by electricity.

The proposals shall state the price per lamp for which the bidder will furnish for and during the period of five years, electric lamps to the number of 125 of what is known as full arc lamps, or 160 of half arc lamps and all poles, including lamp poles properly equipped for the lamps, and all apparatus, fixtures and accessories required for said lamps, and furnishing electric light, and operate and maintain and keep in repair said lamps, apparatus, fixtures and accessories, according to the terms and provisions of the specifications prepared therefor, now in the office of the City Clerk of said Holyoke, where they may be inspected and examined.

The proposals must be sealed and addressed to the Chairman of the Committee on Fuel and Street Lights, Holyoke, Mass., and must be in the said chairman's hands on or before May 9th, at 6 o'clock, P. M.

The committee reserve the right to reject any or all bids.

M. P. CONWAY, Chairman.
Holyoke, Mass., April 26, 1890.

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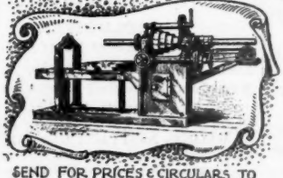
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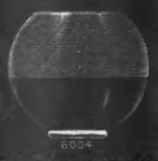
GLOBES  SHADES
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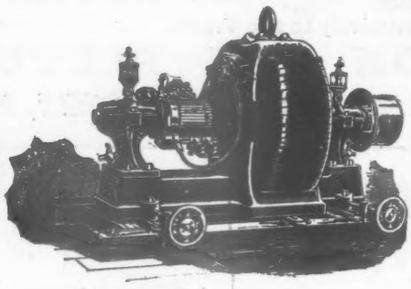

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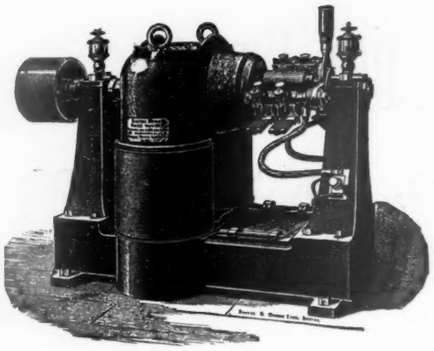

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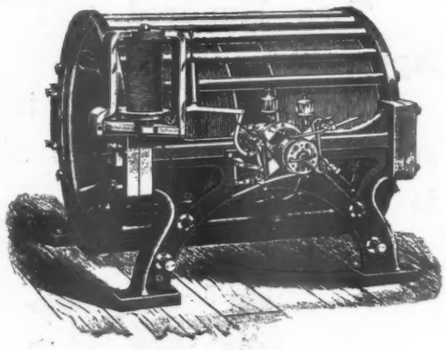

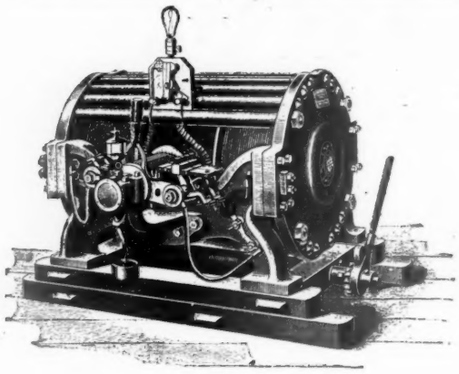

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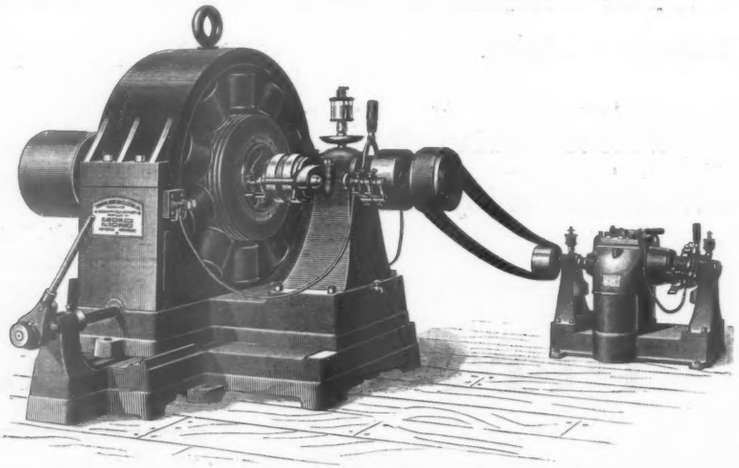

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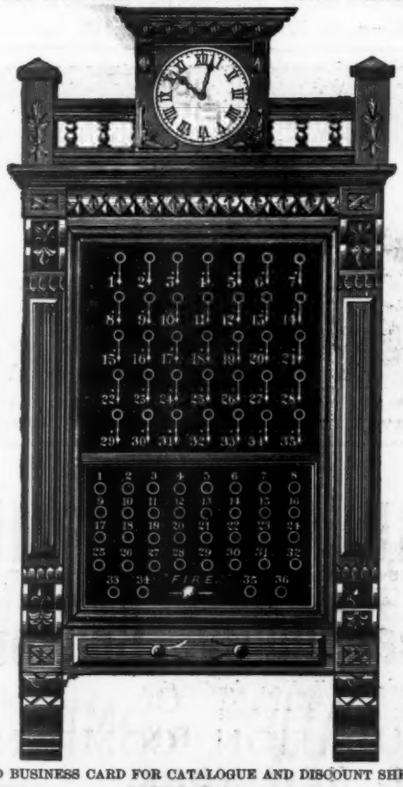

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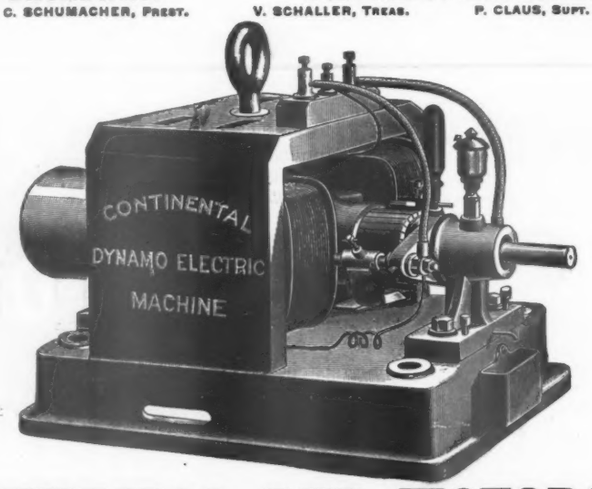

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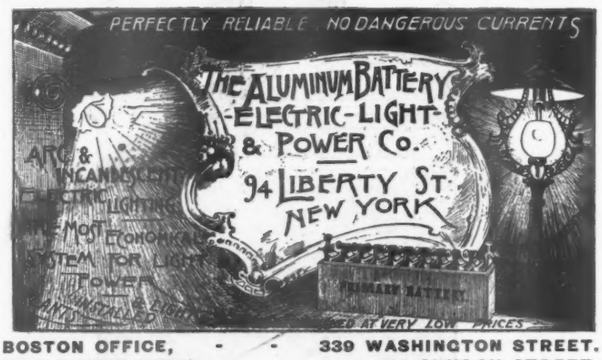

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	X	Y	Z					
C	8				6.5	1¼		530
C		10			6.5	1½		530
C				25	8.0	2		530
C	16				12.0	2½		780
C		20			12.5	2½		780
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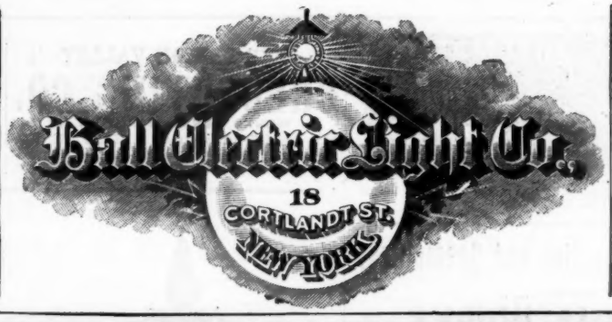

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	X	Y	Z					
C		35			21.0	4		1,900
C			45		21.0	4		1,900
C				70	21.0	4½		1,900
C	40				29.7	6		1,750
C		50			30.0	6		1,750
C	52		64		39.5	6		1,750
C					38.0	8		2,290
C		65			38.6	8		2,290
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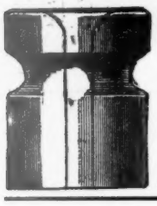

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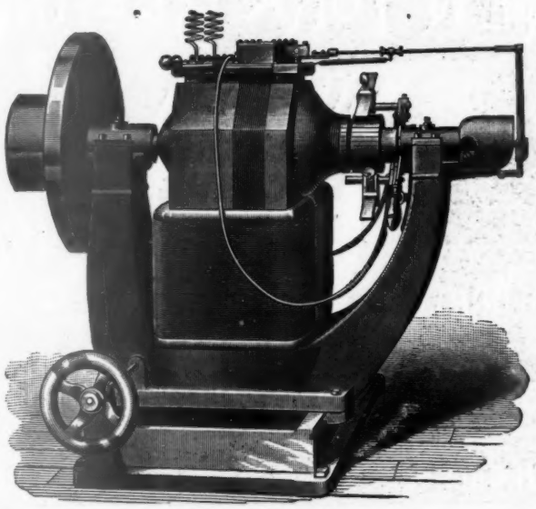

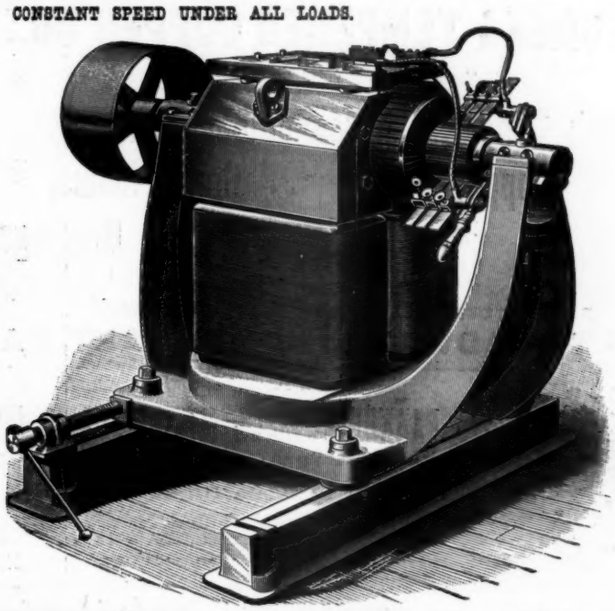

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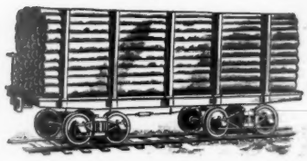

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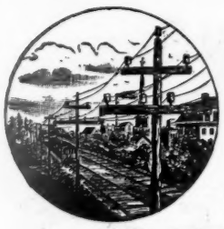

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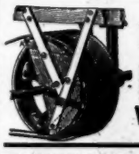

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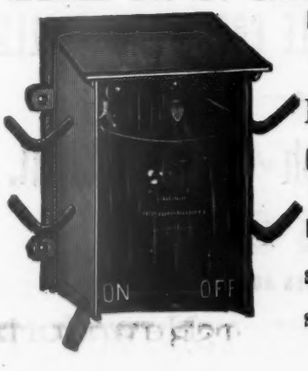

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FIG. 1.

Fig. 1 represents Copper Tee used for branching from main cables, as shown in Fig. 2.

FIG. 2.

Fig. 3 represents a Copper Sleeve used for straight connections for continuation of cables.

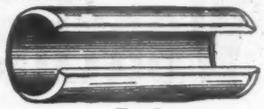

FIG. 3.

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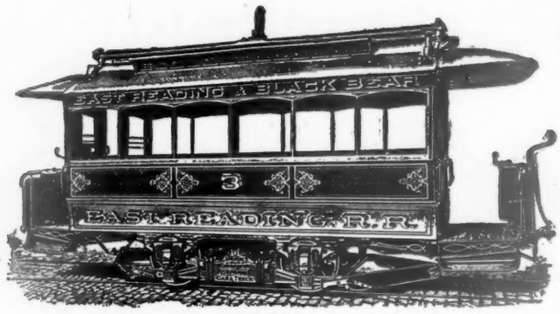

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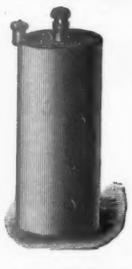

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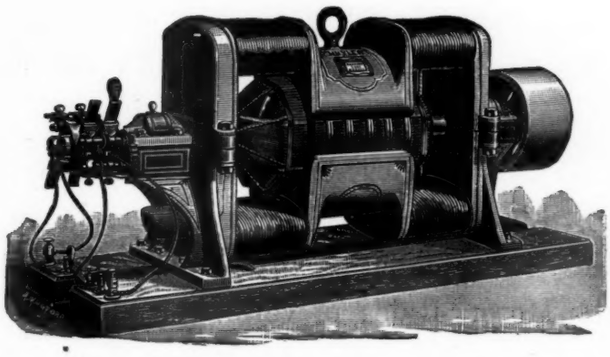

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55 KILBY ST., Room 63.
BOSTON, April 21, 1890.

ELECTRICAL SAFETY COMPANY,
H. E. TOWNSEND, ESQ., Treasurer.

DEAR SIR: In reply to your favor of this date, permit me to say that the Cartwright Electrical Protector submitted by your company at the recent test of Electrical Safety Devices made by the Boston Fire Underwriters' Union is reported to us as having met in a satisfactory manner all the conditions of the test, and the use of the said Protector will be approved by our Inspectors.

I am, yours truly,
(Signed) OSBORNE HOWES, JR., Secretary.

BOSTON, April 12, 1890.

ELECTRICAL SAFETY COMPANY.

GENTLEMEN: As Chief Inspector of the Boston Fire Underwriters' Union, I had charge of the tests recently made upon Safety Devices for the Protection of Electrical Instruments and Circuits, and reported the results of the same to the Board.

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Capt. William Brophy, of the New England Insurance Exchange, was present at the tests and joined in the endorsement of the Cartwright Protector.

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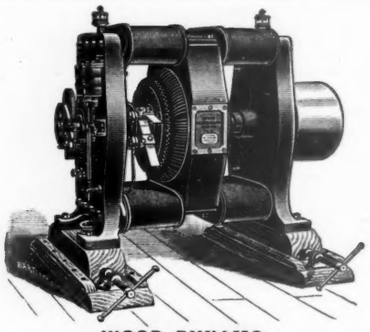

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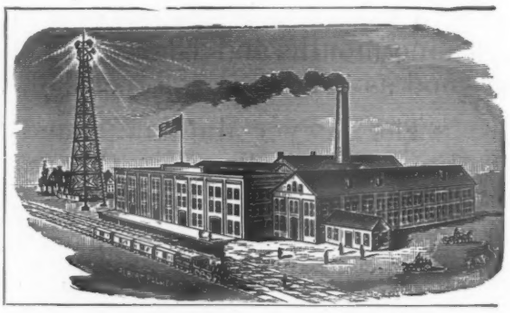

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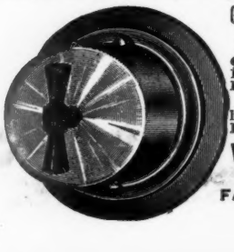

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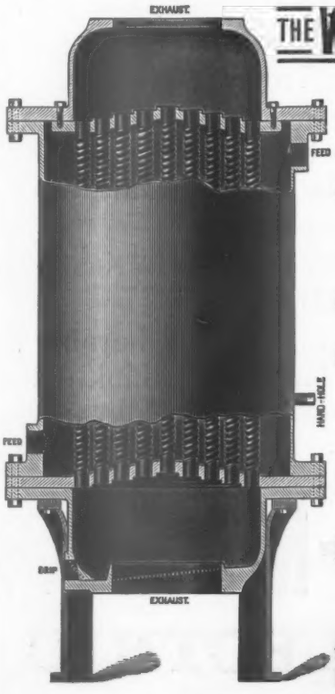

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